STUDY #2
COMMUNICATION AND INFORMATION TECHNOLOGIES SECTOR
FINAL REPORT

Prepared for:
Evaluation Steering Committee
Canada-Manitoba ERDA
Subsidiary Agreement on
Communications and Cultural
Enterprises

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THIS IS ONE OF FOUR STUDIES THAT FORM PART OF THE EVALUATION OF THE CANADA/MANITOBA COMMUNICATIONS AND CULTURAL ENTERPRISES SUBSIDIARY AGREEMENT.

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EXECUTIVE SUMMARY

Introduction and Program Description

This is Study #2 of the evaluation of the Canada-Manitoba Subsidiary Agreement on Communication and Cultural Enterprises, signed on June 11, 1984 and expiring on March 31, 1989. This study concentrates on the economic impacts of the Agreement on one of the sectors covered in the Agreement, the communications and information technology sector. This sector was covered by Component 1 of the Agreement: Technology Applications Projects, and is implemented and funded entirely by the Federal government, with complementary initiatives being undertaken by Manitoba. Support was provided to projects in the sector through cost sharing (50% as a guide) of project costs for both technical development and application of new technologies and for market expansion.

The Technology Applications component of the Agreement is administered by the Agreement's Management Committee, with the assistance of the joint federal-provincial Technology Applications Steering Committee.

As of March 31, 1988, $1,933,000 had been expended and $3,919,000 allocated, leaving $98,000 of the total $5,950,000 open. A wide range of projects were funded: electronic publishing; educational courseware development; natural language processing; business opportunity data base; nursing systems; expert systems; and graphic software to name a few. Exhibit 2.1 lists all projects funded.

Evaluation Framework and Methods

The objectives of this study are to:

- develop an industry profile;
- identify major industry problems;
- assess the effects of the Agreement on the industry;
- determine if the program will solve the industry problems identified; and
- suggest any changes to the program if required.

Appendix A lists the questions, indicators and data sources from the Terms of Reference for this evaluation. The following data sources were used:

- personal interviews with project beneficiaries for 18 of the 21 projects receiving funds;

- personal interviews with 11 firms which did not receive funding, either because they were rejected or withdrew;

- personal interviews with 5 program managers - members of the Technology Applications Steering Committee;
- personal interviews with representatives of three industry associations;
- review of project files, Steering Committee minutes and progress reports;
- review of documentary sources of industry data; and
- a focus group meeting with four senior representatives from industry to discuss qualitative issues and the focus required of any future programs.

During data collection some beneficiaries were unable to supply forecasts of project employment, private investment, other government investment or gross sales revenue, and even those able to forecast noted the uncertainty of the forecasts. Because of the uncertainty, forecasts have been reduced to 20% to 40% of those given, to reflect the potential for actual sales etc. to fall short of hoped for projections.

To assess program impacts one must project what would have happened if the program had not existed. The difference between performance with and without the program represents the impacts of the program. Based on interviews we estimate that 13% of project expenditures, employment, sales and investment would have occurred without the support of the Agreement's contribution - leaving 87% which would not have occurred without the program.

Project beneficiarie's total project expenditures, sales revenues and employment have been used to estimate direct economic impacts. Expenditures on purchases of materials, supplies and services from others were used to estimate indirect impacts. Direct employee wage and salary respending was used to estimate induced impacts. Only incremental impacts (after deducting the 13% which would have occurred without the program and reducing impacts to 20% - 40% of the future estimates to account for probable success rates) are considered the result of the program. Gross investment or employment or sales are not attributed to the program.

Manitoba's Communication and Information Technology Sector

Three industries make up the communication and information technology sector:

- communication services;
- computer services; and
- electronics manufacturing

These are among the fastest growing industries in Canada and the world. In spite of an overall trade deficit in electronics and computer services, Canada has a trade surplus in telecommunications equipment and some telecommunications services.

In Manitoba these three industries include a tremendous diversity and variety of firms, five of which (Manitoba Telephone System, Unisys, Northern Telecommunications, Canada Wire & Cable and GEC Canada Ltd.) account for well over half of the sector's employment and revenues while between 100 and 200 small firms account for less than half. Most large firms rely on out of province parent or affiliates for their markets while small firms rely more on local niche markets.

In 1984 the Manitoba sector generated about $762 million in revenues and employed about 9,940 people, roughly 4% of the total Canadian sector. Revenues in Manitoba have been growing rapidly. Although some firms (especially software) have highly innovative products, the technology used in research and development is low, partly because of the difficulty in attracting private capital and partly because of a dependence (of some firms) on the small local market.

Small Manitoba firms export little of their products and services and are often financially overextended, hampering all aspects of the innovation, application, production and marketing cycle.

Evaluation Findings

Exhibit 1 summaries the program's incremental impacts to date and the forecasted annual incremental impacts by 1991/92.

The program has only partly achieved its objectives to date but should achieve them within a few years as projects are completed. To date, the program has contributed to the creation of 6 new enterprises and about 64 person years of direct and 3 person years of indirect and induced employment. It has improved industry infrastructure, simulated private investment by $1.4 million, increased sales revenues slightly

by $230 thousand and marketing expenditures by $260 thousand. Most of the impacts of the program - and the projects funded- have yet to occur and no productivity gains have yet occurred.

EXHIBIT 1: SUMMARY INCREMENTAL IMPACTS

	Total To Date	By 1991/92 Annually
Employment - Direct	64 person years	108-216 person years
- Indirect & Induced	3 person years	137-275 person years
Total	67 person years	245-491 person years
in Manitoba - Direct	59 person years	99-198 person years
- Indirect & Induced	1 person years	55-110 person years
Total	60 person years	154-308 person years
Productivity	--	+0.4-0.9%
Private Investment	$1.4 million	$1.3 - $2.7 million
Marketing Expenditures	$260 thousand	$2.0 - $2.7 million
Sales Revenue	$230 thousand	$12- $24 million
Exports	$80 thousand	$7.1 - $14.3 million (but uncertain)
Gross Domestic Product		
- Direct	$156.2 thousand	$8.2-$16.3 million
- Indirect & Induced	$80.5 thousand	$5.2-$10.3 million
Total	$236.7 thousand	$13.3-26.6 million
in Manitoba		
- Direct	$142.9 thousand	$7.5-14.9 million
- Indirect & Induced	$39.3 thousand	$2.3-$4.5 million
Total	$182.1 thousand	$9.8-$19.4 million
Diversification	several new firms and activity in several new fields	unknown
Managerial Skills	some improvement	some improvement in some firms
Profitability	--	unknown but likely to increase

EXHIBIT 5.24: SUMMARY IMPACTS (cont'd)

	Total To Date	By 1991/92 Annually
Manitoba Content	--	unknown
Distribution of Benefits	allocated proportionately to all eligible fields and all firms sizes but not proportionately to all social groups	
Program Delivery	slow and uncertain application process for half of respondents	
Awareness of Program	low awareness in first 2 years but much higher since Brandon Workshop. Still low awareness of projects funded.	

By 1991/92 added sales revenues are expected to reach between $12-$24 million and marketing expenditures between $2-$4 million annually. Employment will increase as sales grow. By 1991/92 between 108 and 216 person years of direct project employment and 137 to 225 person years of induced and indirect employment will be created annually. Infrastructure improvements and major changes in the sector's economic and financial indicators will begin to extend beyond program beneficiaries only as their projects begin to reach sales targets and other firms in the sector are benefited by growth in the sector's sales and employment. By 1991/92 annual Gross Domestic Product is expected to be $13-$26 million higher as a result of the program, $10-$19 million of which will be generated in Manitoba.

Overall program effectiveness has been good. There is general agreement that help is needed to attract financing for new product or service development and the model chosen by the program - lowering investor risk by government contributions - is widely accepted as an effective mechanism. Many respondents praised staff and program managers for their efforts and assistance.

However, any program can be improved, and the report contains some suggestions for future programs related to program

Break Even Benefit/Cost Analysis

We cannot definitely conclude that benefits will exceed costs (because of the uncertainty of forecasts of benefits such as increased profits and labour income for beneficiaries, productivity gains for their customers, and indirect developments, we were only able to make order of magnitude estimates of one type of benefit - increased operating profits and labour income of beneficiary firms). However, benefits are likely to exceed costs. Although we only estimated one of three potential benefits, benefits still roughly equal the costs of the program, assuming a 10% discount rate. If other benefits could be quantified, we expect program benefits would exceed costs.

Conclusions

Over the course of the next few years the objectives of the program will be attained. Economic and financial indicators in the industries have improved only slightly to date because of the program - except for private investment which has grown considerably - but as projects are completed revenues, productivity, employment, private investment and marketing expenditures will all increase.

Lack of capital and lack of marketing (both marketing expertise and a distribution infrastructure) are still the major problems faced by the industry. In all high technology fields, a gap continues to exist between the research and commercialization of new products and services. The Agreement's formula is clearly the most effective mechanism to help the industry.

Recommendations

Future programs should consider the following recommendations:

- Establish a quick, clear cut delivery system;
- Provide publicity early in the program to stimulate proposals;
- Avoid funding ordinary operating expenses of new start up firms;
- Encourage repayment or more highly leveraged contributions for projects in later stages of development;

- Allow changes in project focus;
- Fund market planning at each stage of technical development in projects; and
- Increase support to projects with private sector partners.

1.0 INTRODUCTION

1.1 Evaluation Context

The Canada-Manitoba Subsidiary Agreement on Communication and Cultural Enterprises focuses on stimulating investment and improving the necessary infrastructure to foster the growth of communications and cultural enterprises in Manitoba. This study is part of the evaluation of the economic impacts of the Agreement. The Agreement was signed on June 11, 1984 and expires on March 31, 1989. It is a subsidiary of the Economic and Regional Development Agreement (ERDA) signed on January 4, 1984. The purpose of the 10-year ERDA is to provide a formal means by which Canada and Manitoba can cooperate to better achieve economic development objectives for the province.

A Management Committee, co-chaired by representatives of the Federal and Provincial Ministers, is responsible for the administration and management of the Agreement. Component 1 of the Agreement covers Technology Application projects aimed at the communication and information technologies sector. This component is administered by the Technology Applications Steering Committee.

This evaluation of the economic impacts of the Agreement is designed to contribute to:

- fulfilling the obligations (under the Agreement) to evaluate program effects; and
- providing policy makers with the information needed to reconsider the Agreement's programs.

Responsibility for conducting the evaluation has been given to an Evaluation Steering Committee and is being conducted in four separate studies, of which, this is Study 2, on the impacts on

one of the sectors covered by the Agreement: the communication and information technology sector.

1.2 Evaluation Purpose

The objectives of this study are to:

- develop an industry profile using the main economic and financial indicators and putting the Manitoba industry into the Canadian and international perspectives;
- identify major industry problems;
- assess the effects and impacts of the Agreement on the industry using mainly the information provided by program beneficiaries;
- determine if the program will solve the problems identified above; and
- suggest any changes to the program if required, taking into account industry problems and other government programs.

1.3 Role of Communication/Information Technologies in Economic Growth

As noted in Communications Canada's, Communications for the Twenty-First Century, communications and information technologies are central to the development of each of Canada's regions and to the reduction of regional disparities. Many other nations have also recognized this sector's role in economic development. As well as applying technology to improve the competitiveness of established industries, it can be applied to create opportunities in new industries just evolving.[1]

A nation's technological capability is critical to its international competitiveness and to overall economic growth. Innovations (new products, new services, new processes, etc.) create new business opportunities and new employment as well as

reducing costs and conserving resources. When applied, new technology usually results in productivity increases. If industries in other nations introduce cost saving technology and Canadian industry does not, Canada is in danger of losing its share of the international market, or even of becoming an importer of that industries goods and services, therefore Canadian industry must keep up with technological developments,[2] or face a declining standard of living and slower economic growth.

There is now much concern about low Canadian productivity growth. Although new technology is only one of the factors affecting productivity, recent research in the U.S. suggests that technological change has been directly responsible for about 30 percent of past economic growth in that country and indirectly responsible (through its positive effect on other factors of production - increasing labour quality, improving the efficiency of capital investment) for perhaps another 40 or 50 percent of economic growth.[3]

Although all industries benefit from the interaction between new technology, capital investment and increasing labour quality, nowhere are results more dramatic today than in the communications and information technology sector. Communications has always played a central role in Canada's economic development but like the rest of the world, Canada is now facing a profound transformation in our economy - from a goods based society to an information based society. New technologies in this sector are developing more rapidly than ever before. And the basis of our future economy will rest on the communications infrastructure, just as today it rests on the transportation infrastructure of the country.[4]

The principal factors driving economic development in communications and information technology industries are the

increased amount of information that can be handled electronically and the integration of various media (voice, data, image, text). As our ability to store, process and transmit information increases and as new software increases the number and types of applications of information, the economic potential of each worker is vastly improved. This increased economic potential extends beyond the communications and information technology sector itself and includes all industries that use information - as the new technologies are adapted to each market, other industries improve their ability to create, move, store and use the information they need to operate.

Innovation is only part of the stimulus to economic development. As in all industries, innovations in communication and information technology require teams of engineers and salesmen. They require sensitivity to market needs (not technology for its own sake) and a bold strategy backed by lots of investment. They need hard work as well as invention. Even with hard work many projects will not succeed, simply because others work harder or have more money to develop different ideas. Innovations may generate economic benefits but they also may fail.

Although the sector is strong in Central Canada, communication and information technologies have a considerable diversity and variety of firms in Manitoba. Rather than encouraging the sector to grow only in Central Canada, the two governments have decided to help build the sector in Manitoba as well.

This policy recognizes that the regional economy must develop its strengths in the sector if it is to benefit from the productivity gains and diversification which new technologies offer. Unless the province adopts and initiates research into new communication and information technologies it will gradually be relegated to producing goods and services which are losing their markets to more innovative industries.

Communication and information will play an increasing role in the future world economy. If Manitoba is to participate in, rather than only follow, this future economic development, it must find a role for itself. Both governments have recognized this. While not all regions can develop strengths in all communications and information fields, each must find areas of specialized strength if their economies are to develop more than only resource dependent industries.

FOOTNOTES -- SECTION 1.0

1. Communications Canada, Communications for the Twenty-First Century, 1987.

2. Statistics Canada, 88-201, Science and Technology Indicators, 1987, Feb. 1988.

3. Landau, Ralph, U.S. Economic Growth, Scientific American, June 1988, pp. 44-52.

4. Communications Canada, 1987

2.0 PROGRAM DESCRIPTION

2.1 Background and Rationale

The two governments included communication and information technology industries in the Agreement because they:

- offered opportunities for employment creation, productivity improvements and other economic benefits;
- were consistent with both governments efforts to diversify the economy, building on existing strength and where possible improve the balance of trade; and
- were recognized to have a close relationship with social objectives and the quality of life in the province.

The communication and information technology industries have historically played an important role in Manitoba. Manitoba Telephone (MTS, provincially owned and operated) generates several hundred million dollars of revenue, employs thousands of people, and has promoted the development of innovative technology. Early videotex initiatives were conducted in Manitoba. (Project Ida, Grassroots, Elie-St. Eustache fibre optic field trials) and the province has a strong local broadcasting industry (in both official languages as well as native and multi-language).

New technologies were recognized to present benefits to these industries -- to reach larger and new markets - and to present opportunities for the development of new industries.

2.2 Objectives

The Canada Manitoba Subsidiary Agreement on Communications and Cultural Enterprises was signed by the Provincial and Federal Ministers on June 11, 1984 and terminates on March 31, 1989. Its purpose is to establish a framework for implementing measures to support communications and cultural enterprises and it lists the

following objectives:

a) complement the economic development strategy for Manitoba as outlined in the Agreement;

b) increase employment and income opportunities in Manitoba through the growth and enhancement of communications and cultural enterprises;

c) maximize the social and economic benefits to Manitobans and all Canadians from an increased development of cultural products;

d) foster the creation and increased production of cultural products in Manitoba and to increase access to Manitoba's cultural products by strengthening existing markets, encouraging expansion into new ones and expanding audiences;

e) strengthen the human, managerial, creative, financial, technological and structural resources of communications and cultural enterprises in Manitoba; and

f) stimulate private sector investment in the creation and distribution of Manitoba's communications and cultural products, in addition to existing public sector program.

The development strategy was to be achieved through:

1) improving the INFRASTRUCTURE related to production, distribution and consumption as required to meet the development needs of the province's communications and cultural enterprises sector;

ii) strengthening the PRODUCTIVITY of human, managerial, and technological resources of the sector;

iii) stimulating private sector INVESTMENT in the creation and distribution of Manitoba's communications and cultural products; and

iv) fostering the creation and increased production of cultural products in Manitoba and increasing access to these products by accelerating MARKETING efforts and encourage expansion from new ones.

Nine component programs were initiated under the Agreement, the first of which was aimed at communications and information technologies - Component 1 Technology Applications Projects.

This component is implemented and funded entirely by the Federal government, with complementary initiatives being undertaken by Manitoba. Its overall objective is to further economic development of the province through the development and implementation of specific applications projects in communications and information technologies. Support was provided to projects through cost sharing (50% as a guide) of project costs for both technical development and application of new technologies and for market expansion.

The components' specific objectives were developed by the steering committee appointed to oversee the component and include:

a) to increase long-term employment and business opportunities in Manitoba through the growth and enhancement of communications and informatics enterprises;

b) to strengthen the productivity of human, managerial and technological resources of the communications and informatics sector in Manitoba;

c) to strengthen existing markets for communications and informatics products and services in Manitoba and expand into new ones;

d) to improve the infrastructure related to the production, distribution and consumption to meet the needs of the province's communications and informatic sector;

e) to stimulate private sector investment in the design, development and distribution of communications and informatics products in Manitoba;

f) to improve opportunities for the research, development and applications of advanced communications and informatics technologies in Manitoba;

g) to improve the international competitiveness of communications and informatics companies in Manitoba; and

h) to contribute to the economic, social and industrial development in Manitoba in particular and Canada in general.

The Agreement cited four initial applications:

- development of a local area network ;
- electronic publishing;
- teleradiology, and;
- educational courseware development.

As the program developed, other projects were also examined and not all of the initial applications were funded. Educational courseware and electronic publishing were funded.

InfoTech, Manitoba's complementary initiative in this area, opened a $4.5 million resource centre in September 1985. InfoTech is the operational arm of the Province's Information Technology Program which provides incubator support for software companies and has taken an active role in developing opportunities - both through the Agreement and separately. A cooperative development between the Province and eight private computer firms (who donated equipment and technical support worth $4.3 million over three years,) is designed to help small firms address their technology needs and show school teachers the uses of computers in the classroom.

2.3 Program Overview

The Technology Applications component of the Agreement is administered by the Agreement's Management Committee, with the assistance of the joint federal provincial Technology Applications Steering Committee. The Steering Committee's role is to oversee and guide the component, facilitate coordination with provincial initiatives, report to the Management Committee on progress, and present approved projects for their review.

The Steering Committee was established in August 1984 and began to define its role and plan of action.

The development plan it produced stated that, to be eligible for consideration, a project must demonstrate that it is consistent with the component's specific objectives and set the following criteria for evaluating projects:

1. The applicant must demonstrate that the project is commercially viable on a long term basis. Indicators of viability will include the following:

   - evidence that markets have been identified sufficient to support the proposed venture (marketing plans),
   - the availability of equity and debt financing (financing plan),
   - the capability of the management and marketing team,
   - the feasibility of, and the potential for commercialization of, the technological development. Pro forma annual financial statements for at least the first five years of production must be provided, and
   - the availability of essential human and material resources.

2. The applicant must demonstrate a need for financial assistance.

3. The applicant must demonstrate that the project will produce significant economic, social and industrial benefits to Manitoba, and Canada in general.

The initial emphasis of the component was on the four applications identified in the Agreement but this was not to preclude consideration of promising projects in other areas. As anticipated, some of the projects did not proceed and the resources made available for other projects were reallocated.

By the summer of 1986 the Steering Committee had more uncommitted funds than anticipated so it was decided to draft a guide for the submission of proposals and publicize the program as widely as possible to solicit new proposals. The Committee decided that a more proactive approach should be adopted and consultations held with the industry.

A Mid-Term Strategic Options Workshop was therefore held in Brandon, February 8-10, 1987 with participants from 20 companies and the federal and provincial governments. Over 100 ideas on how to best use ERDA funds in the component over the next two years were discussed in working groups and in a final plenary session. After the workshop the Steering Committee met to formulate a Strategic Action Plan. Briefly, the plan's directions were to:

- increase awareness of the program in the industry;
- place more emphasis on funding marketing activities in all projects;
- consider areas for increased partnering of firms;
- aid in the search for venture capital by allowing higher than 50% contribution in cases of start up companies or high risk projects and by encouraging consultation with venture capital partners early in the project screening stage;
- help industry benefit from government procurement;
- continue using funds in pilot and test projects;
- fund feasibility studies;
- bring the need for management training to the attention of responsible groups;
- support specialized and niche market projects;
- solicit applications in priority opportunity areas (10 areas were discussed);
- investigate the possibility of establishing a software publishing house;
- streamline application processing procedures;
- continue coordinating with other government programs; and
- help improve industry/government liaison.

By involving industry, the committee increased awareness of the program as well as getting industry's assistance in refining the direction of the program for the remainder of the Agreement. Increased awareness was particularly important as the component then had approximately $3.9 million uncommitted.

To increase awareness further, a consulting firm was contracted to assist in stimulating proposals by telephone contacts with firms in the industry. This is referred to as the "proposal

stimulation project". Almost 50 new proposals were generated from this approach and the program quickly had more project ideas than funds.

In September of 1987 the possibility of the demand for assistance exceeding the available funding was discussed by the Committee and they reviewed their criteria to ensure that projects chosen would have the maximum economic impact on the province. They agreed that projects funded should:

- continue to have an impact on the industry infrastructure;
- reflect the strategic priorities of the Department of Communications and the Government of Manitoba;
- be high risk;
- increase the innovation capability of the industry;
- complement not overlap, other programs;
- have a mixture of start up, small and well established companies, with a tendency towards the first two; and
- maximize the leverage of the remaining ERDA funding.

From October 1987 on the Committee decided to award 50% ERDA funding only if no other funds are available and the project cannot be completed with less.

Exhibit 2.1 shows the funding spent and allocated as of March 31, 1988 and lists each project receiving authorization. The financial status of the program at that time was:

Total Budget	$5,950,000
Expended	$1,933,000
In Progress	$3,919,000
Open Budget	$ 98,000

Of the projects funded to date, about $88 thousand have been for administrative functions such as evaluating proposals,

performing audits, encouraging proposals or exploring partnering opportunities. Another $245 thousand has been spent on projects which were primarily or solely market studies.

EXHIBIT 2.1: FUNDING DELIVERED AND ALLOCATED (AS OF MARCH 31, 1988)

Date Approved	Project Beneficiary	Description	Financial Status			Project Status
			Expended	In Process	Total	
			($ thousands)			
June 1985	Electronic publishing:					
	--	Proposal assessment	5		5	completed
	Grassroots	Enhanced service programs	288		288	cancelled
	Cybershare	Mineral exploration/on-line database	90		90	cancelled
	InfoTech Inc.[1]	Home management information reference system			--	cancelled
	Homestead	Farm management training courseware	61		61	completed
	MTS	Telephone network integrated message system	50		50	completed
	MTS/Rescom	Computerized stock price voice system	23		23	completed
July 1985	MCACL	Education courseware development	600	120	720	in progress
Jan. 1986	--	Animation centre study	25		25	completed
July 1986	NATCO	Automatic Meter Reading			--	cancelled
July 1986	NORLUS	Natural Language Processing	500		500	completed
Dec. 1986	The DPA Group	Business Opportunity Data Base Study	90		90	completed
Dec. 1986	Terry & Associates/ Clinicom	Strategic Planning Workshop	30		30	completed
Jan. 1987	SubRosa	Visual program generator	30	174	204	in progress
Mar. 1987	--	ERDA project monitoring and reporting system		1	1	in progress
May 1987	Ubitrex	Nursing unit reporting system market study	14		14	completed
June 1987	Terry & Associates	New proposal stimulation project	25		25	completed
July 1987	IRIS	Partnering opportunity study	25		25	completed
Sept. 1987	GEC Canada	Multi channel microwave distribution service	18	185	204	in progress
Oct. 1987	CAD Systems	Desktop publishing graphics software	14	161	175	in progress
Oct. 1987	Ubitrex	Nursing unit system development		1135	1135	on hold
Nov. 1987	--	Proposal evaluation assistance fund			--	not used
Nov. 1987	--	Canadian Telematics and Health Care Centre	25	575	600	in progress
Dec. 1987	IRIS	Automatic Meter Reading	17	553	570	in progress
Jan. 1988	Homestead	Expert system crop planner		248	248	on hold
Jan. 1988	Rescom	Stock brokers expert system		194	194	in progress
Mar. 1988	IAI	Cancer treatment protocol expert system		410	410	in progress
Mar. 1988	Voisys	Computerized voice response system		163	163	in progress
no date	Clinicom	Technical applications study	2	--	2	completed
		Total	$1,933	$3,919	$5,852	

[1] Not related to the Manitoba government's InfoTech.

3.0 EVALUATION FRAMEWORK AND METHODS

3.1 Evaluation Issues, Indicators and Data Sources

Appendix A lists the questions, indicators and data sources, from the Terms of Reference for this evaluation. Study methods were designed to answer questions covered by Study #2. All evaluation questions for this study were interpreted to be asked from the point of view of the program's effect on the communications and information technology sector.

The following data sources were used in the study:

- personal interviews with project beneficiaries - senior staff involved with 18 of the 21 projects receiving funds under the Technology Applications component were interviewed. For two projects with no beneficiary, senior DOC staff responsible for the projects were interviewed,. The 21 projects do not include purely administrative projects such as the proposal assessment, project monitoring and reporting system or proposal evaluation fund;

- personal interviews with 11 nils - firms which did not receive funding, either because they were rejected or withdrawn. This was a randomly chosen sample of firms from those 35 project files and applicants identified in the proposal stimulation project which did not receiving funding;

- personal interviews with five program managers - members of the Technology Applications Steering Committee;

- personal interviews with representatives of three industry associations;

- review of project files, Steering Committee minutes and progress reports;

- review of documentary sources of industry data, including Statistics Canada, the Department of Regional Industrial Expansion, InfoTech, Manitoba Bureau of Statistics and material produced for the Steering Committee's Mid Term Review; and

- a focus group meeting with four senior representatives from industry to discuss qualitative issues and the focus of any future programs.

Interview guides used for personal interviews are shown in Appendix B.

3.2 Data Collection and Analysis

3.2.1 Forecasts

During data collection only two major problems arose:

- **inability of some beneficiaries to supply forecasts**
  Because most of the economic impacts of projects lie in the future, when the majority of program funds are allocated to be spent and projects begin to generate sales revenue, some beneficiaries were unable to estimate their projects effects for every year of our forecast period - up to 1991/92. Up to 40% of beneficiaries were unable to supply forecasts of revenues, expenditures or employment in 1991/92, either because of the uncertain nature of their business, their lack of knowledge of the market or the confidential nature of their project; and

- **uncertainty of forecasts**
  Even those able to make forecasts noted their uncertainty. On average, employment forecasts were estimated by beneficiaries to be only 70% probable, private investment forecasts 75% probable, other government investment 65% probable, and gross sales revenue 49% probable.

Those unable to supply forecasts were assumed to experience sales, employment, etc. equal to the average of those able to forecast[1]. This assumption is subject to a possible low response bias. Those unable to make forecasts may experience lower revenues, and employment impacts than those able to supply forecasts if their inability to forecast is caused by a lack of market knowledge. To some extent this bias will be

offset by a tendency to overestimate revenues and employment by optimistic beneficiaries who could provide forecasts. The characteristics of the two groups were investigated to decide what, if any, overall bias may have resulted.

The lowest response rate was obtained for the question on 1991/92 expenditures, where only 11 out of 18 beneficiaries could give their forecast[1]. The seven beneficiaries unable to give expenditure forecasts are compared with those able to in Exhibit 3.1. Although those able to respond to this question have, on average, larger ERDA contributions for their projects and larger present revenue and full time employment, this is mainly because of one large beneficiary, Manitoba Telephone.

Excluding MTS therefore, those able to forecast have higher average ERDA contributions and lower average present revenues and employment. Those able to forecast are often (but not always) new start up firms, and Exhibit 3.1 shows their average date established in Manitoba to be a few years more recent than those unable to forecast.

Small and recently established firms were better able to forecast; therefore the forecasts are uncertain. Because of the uncertainty of forecasts the Study Team (after discussion with the Evaluation Steering Committee) decided to reduce the forecasts given in interviews to reflect the potential for actual sales, etc. to fall short of projections given by beneficiaries.

The beneficiaries themselves supplied estimated probabilities for their forecasts but these were considered to be optimistic: even when realistically assessing the future, they feel their projects are more likely than most to succeed or they would not be involved. As an upper limit, a

40% success rate and as a lower limit a 20% success rate has been assumed in calculating project impacts. These rates were phased in over three years according to the following schedule:

	1988/89	1989/90	1990/91	1991/92
low forecast	40%	30%	20%	20%
high forecast	60%	50%	40%	40%

EXHIBIT 3.1: CHARACTERISTICS OF NON RESPONDENTS AND RESPONDENTS TO 1991/92 EXPENDITURE QUESTIONS

	Unable to Forecast 1991/92 Expenditure (N=7)	Able to Forecast 1991/92 Expenditure (N=11)	Not Interviewed (N=3)	All (N=21)
Average ERDA Contribution ($K)	$157	$356 $352[1]	$293	$281
Average Present Total Revenue ($K)	$2,390	$44,013 $301[1]	n/a	n/a
Average Present Full Time Employment	17	456 7[1]	n/a	n/a
Average Date Established in Manitoba	1974	1978 1983[1]	n/a	n/a

[1] Excluding Manitoba Telephone System

Reducing total sales, employment, investment and expenditures to 20%-40% of that given in personal interviews by 1990/91 not only corrects for possible over optimism of those able to respond, it also reflects the experience of private venture capital investors and the ERDA Technology Application

component itself. Investors have found that, as a rule of thumb, 20% of investments are successful - "super-stars". 60% are only break even - "living dead" and 20% are unsuccessful or go out of business[2]. While the winners normally take five to seven years to mature, losers surface early. Some projects do not succeed and while the firm may not go out of business the project never becomes self sustaining. For example, of the six projects authorized under the component's electronic publishing umbrella project, two are continuing to generate, or contribute to sales revenue, a 33% success rate.

While 20% and 40% are not empirically derived success rates, we have not found any studies which provide evidence of historical success rates. We feel that these are an accurate reflection of the minimum and maximum range of future impacts for the projects funded by the program.

3.2.2 Incrementality

To assess the impacts of a program one must project what would have happened if the program had not existed. The difference between performance with the program and performance without the program represents the impacts of the program.

Both historical and forecasted impacts from interview results were reduced to eliminate effects which would have occurred without the program. Based on interviews we estimate that about 13% of project expenditures, employment, sales, and investment would have occurred without the support of ERDA contributions.

Beneficiaries were asked how much of their project would have proceeded without funding from ERDA:

	Assumed Incrementality
. 3 did not know	--
. 7 would have done none of their project	100%
. 5 would have done a minimal amount	75%
. 0 would have done a moderate amount	50%
. 2 would have done most of their project	25%
. 1 would have done all of their project	0%

When the percentage assumed to be incremental was applied to each individual project's expected expenditures, 87% of the total expenditures would not occur without the program. This percentage was therefore applied to all impacts (together with the 20-40% success rates) to estimate incremental impacts of the program. Actual ERDA contributions were not reduced as none of them would have occurred without the program.

Additional questions were also asked of beneficiaries to find out the status of parallel research in their field. Of the 18 interviewed, 10 said similar projects were underway elsewhere but only three of these were in Canada. Therefore, 15 or 83% of projects interviewed are unique to Canada

If the ERDA program had not existed only five (28%) beneficiaries felt the same project results would be generated, either by themselves or others. However all 5 expected that results would have been delayed by one to two years - reducing impacts.

In comparison, 5 of the 11 nils interviewed said they were going ahead with some or all of their projects, in spite of not receiving ERDA funds. On average about 11% of the planned expenditures of all nils interviewed have occurred without the program.

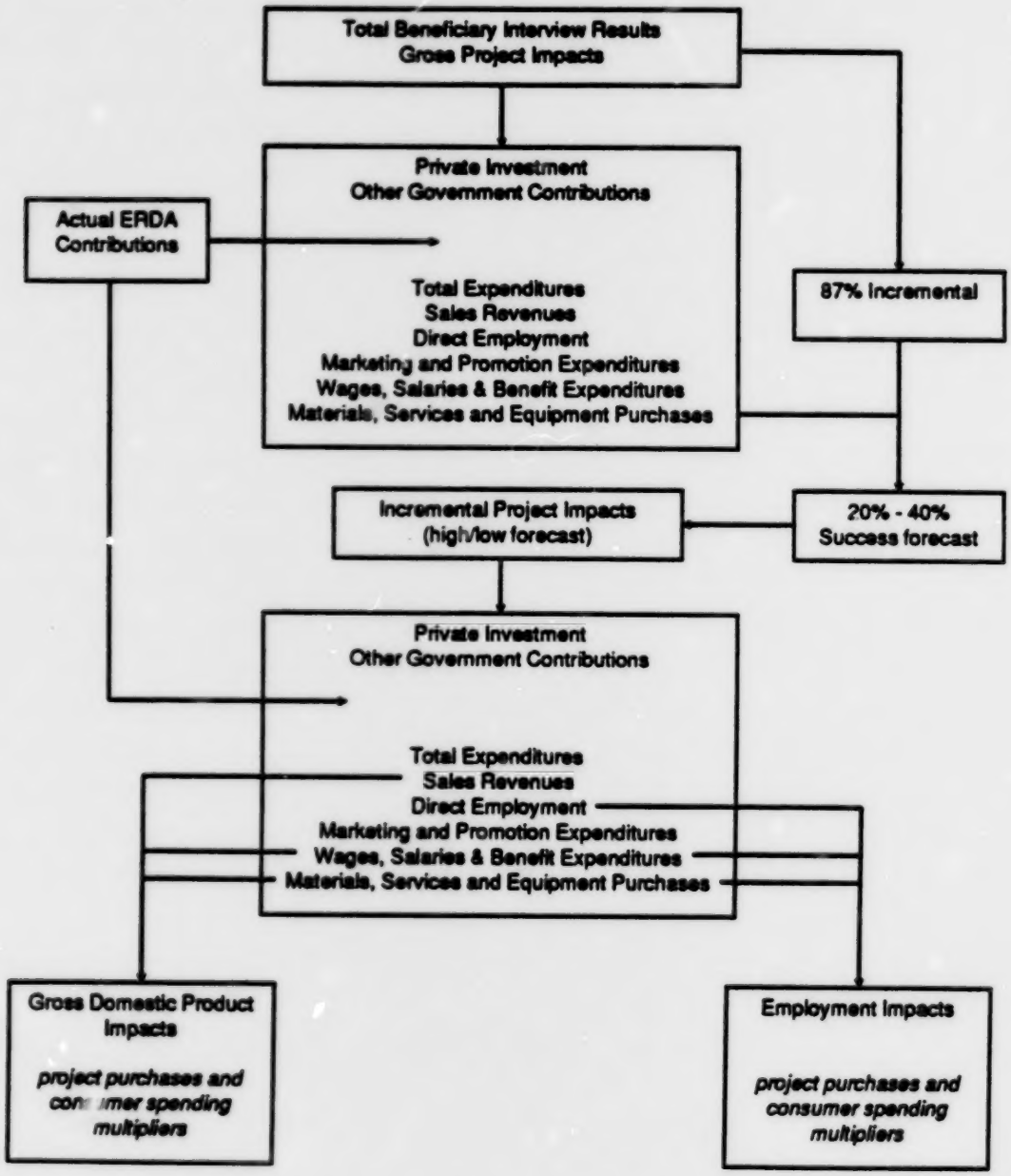
3.2.3 Economic Impact Method

Project beneficiaries' total project expenditures, sales revenues, and employment have been used to estimate direct economic impacts. Expenditures on purchases of materials, supplies and services from others were used to estimate indirect impacts; and direct employee wages and salary respending was used to estimate induced impacts by multiplying them with relevant industry absolute or normal multipliers from the Manitoba Bureau of Statistics and the 1979 Statistics Canada input output model. Appendix C presents the methodology and results in detail and the basic steps are outlined in Exhibit 3.2.

An industry approach was used, as opposed to an expenditure approach - only the income accruing to the communication and information technology sector industries were considered as direct income or employment. Spending by customers of beneficiaries in other industries was only included in economic impacts if it is supplier or consumer spending generated by the beneficiaries own direct income or employment. Beneficiaries' customers who spend on non-project goods and services are not included in the impacts of the program.

Only the incremental impacts are considered the result of the program. Other investment or employment or sales are occasionally noted where appropriate but are not attributed to the program.

Exhibit 3.2: Economic Impact Calculation Method



FOOTNOTES

1 Small start up firms may be more able to forecast because they have had to do so to establish their business while existing firms often operate on the basis of momentum and past experience, without detailed forecasts.

2 George Fells, "Venture Capital in Canada - A Ten Year Review", Business Quarterly, spring 1984.

4.0 MANITOBA'S COMMUNICATION AND INFORMATION TECHNOLOGY SECTOR

4.1 Overview

Three industries make up the communication and information technology sector:

- **communication services**, consisting of telephone and carrier systems, broadcasting and cable;
- **computer services**, consisting of data processing and preparation, software and systems consulting, computer sales and maintenance, and equipment leasing/rental; and
- **electronics manufacturing**, consisting of telecommunications equipment and components, computers and office equipment, instruments and consumer electronics.

In Manitoba, these three industries include a tremendous diversity and variety of firms. Five large firms (MTS, Unisys, Northern Telecommunications, Canada Wire & Cable, and GEC Canada Ltd) account for well over half of the industry employment and revenues while between 100 and 200 small firms account for the remainder[1]. Manitoba's firms offer a diverse range of technology products and services,with few firms in any one field:

- MTS and CNCP Telecommunications offer telephone and other communication services;
- many radio, TV or cable firms provide mass and specialty market entertainment;
- eight firms manufacture consumer products such as turntables or audio speakers;
- six firms manufacture, assemble or refurbish telephone equipment;
- five firms manufacture components such as printed-circuit boards, chassis and wire harnesses;
- twenty-one firms manufacture or custom make alarm systems and public address systems;
- six firms manufacture computer parts or

peripherals;
- four make electronic weighting systems;
- fourteen firms manufacture control, monitoring or measuring instruments;
- one firm manufactures telephone cable;
- two firms make conduits and enclosures for electronics; and
- over 90 firms are involved in developing a variety of computer software such as geographic packages, payroll services, agribusiness applications, etc.

Most of the large firms are controlled by parents or affiliates outside of Manitoba but have considerable financial strength. Most small firms are locally controlled but are generally weaker in their management, marketing and financing. Small firms rely much more than large ones on the local Manitoba market. For most of the largest firms, their main market is their parent or affiliated firm, outside Manitoba. Small firms usually rely more on local niche markets.

Internationally, the communication and information technology sector has recently experienced tremendous growth. The OECD estimates the world production of information technology hardware, software, telecommunications and computing services at $393 billion in 1986 and forecasts growth of 13% annually to 1995[2].

Canada has experienced an increasing trade deficit in electronics and computer services. Exhibit 4.1 shows that in 1982 imports made up 71% of domestic demand but this had risen to 90% by 1985. However, in telecommunications equipment (where several Canadian firms are world leaders) and communications services (where regulations limit the extent of imports) Canadian industry has either maintained a large share of the domestic market or successfully pursued international markets on a large scale.

EXHIBIT 4.1: CANADIAN ELECTRONIC PRODUCTS TRADE DEFICIT

	1982	1985	% Change
	$ Billion		
Apparent domestic demand	8.9	11.0	2.1
Shipments	5.6	6.4	0.8
Exports	3.0	5.3	2.3
Imports	6.3	9.9	3.6
Trade Deficit	3.3	4.6	1.3

Source: DRIE, cited in Tarry & Associates.

In computer services, several Canadian firms have international reputations, especially in data processing and custom software. However, packaged software is the fastest growing part of computer services and most packaged software in Canada is imported. Many Canadian packaged software firms have difficulty competing in this highly volatile and competitive market[3].

In spite of the high level of imports and the many problems experienced by these newly developing Canadian industries, the communications and information technology sector is one of the fastest growing parts of Canada's - and the world's - economy.

The following sections present in more detail a profile of this sector in Manitoba.

4.2 Sector Size and Growth

Exhibit 4.2 shows the 1984 revenues and employment for the three industries in Manitoba and Canada. In that year, the Manitoba communication and information technology sector earned $762 million in revenues and employed 9,940 people

(this includes Manitoba Telephone); 3.7% of the Canadian revenues and 3.8% of Canadian employment in the sector.[4]

Revenues in Manitoba's electrical & electronics manufacturing industry (a larger industry than that under study here but one for which statistics are more available) grew at only 2.8% a year between 1975 and 1978 but from 1978 to 1982 growth increased to 12.6% a year, above the national average.[5] Between 1983 and 1985, revenues of the four (excluding MTS) largest electronics firms in Manitoba grew by an average of 40% a year[6]. As well, the number of small firms also grew rapidly in the mid-1980's, with many small software businesses establishing in highly sophisticated market niches. Between 1981 and 1984 the Manitoba computer service industry revenues (excluding equipment leasing/rental) grew over 30% a year.[7] Since 1984 even more small firms have been established. InfoTech estimates that about 90 firms in Manitoba were involved in developing software in 1987, compared with 48 in 1984.[8]

Sector employment represented about 2% of all Manitoba employment in 1984 and has grown along with revenues since, however, almost all of this increase has been in computing services and electronic manufacturing. Employment communications services has been mostly static or lining.[9] In 1987 firms in software development alone were estimated to employ over 900 people and were expecting their employment to increase an average of 10% a year.

EXHIBIT 4.2: SECTOR REVENUES AND EMPLOYMENT, 1984

	1984 Revenues				1984 Employment			
	Canada		Manitoba		Canada		Manitoba	
	$M	% of Sector	$M	% of Sector	Employment	% of Sector	Employment	% of Sector
Communication Services								
Carrier Systems	560	2.7	N/A	N/A	5,000	1.9	130	1.3
Telephone Systems	9,290	44.6	320	42.0	102,000	38.9	4,640	46.7
Broadcast Systems	1,520	7.3	65	8.5	30,000	11.5	1,260	12.7
Cable Systems	600	2.9	17	2.2	7,000	2.7	170	1.7
Subtotal	**$11,970**	**57.5%**	**$402**	**52.8%**	**$144,000**	**55.9%**	**6,200**	**62.4%**
Percent of Canada	**100.0%**		**3.4%**		**100.0%**		**4.3%**	
Computer Services								
Processing & data preparation	740	3.6	33	4.3				
Software systems and consulting	750	3.6	21	2.8	25,000	9.5	1,080	19.9
Sales & maintenance	290	1.4	14	1.8				
Equipment leasing/rental	1,220	5.9	N/A	N/A	7,000			
Subtotal	**$3,000**	**14.4%**	**$118**	**15.5%**	**32,000**	**12.2%**	**1,220**	**12.3%**
Percent of Canada	**100.0%**		**3.9%**		**100.0%**		**3.8%**	
Electronic Manufacturing								
Telecom equipment & components	3,410	16.4	172	22.6	48,000	18.3	N/A	N/A
Computers/Office equipment	1,470	7.1	44	5.8	15,000	5.7	N/A	N/A
Instrumentation	490	2.4	26	3.4	19,000	7.3	N/A	N/A
Consumer electronics	490	2.4	0	0.0	4,000	1.5	N/A	N/A
Subtotal	**$5,860**	**28.1%**	**$242**	**31.8%**	**86,000**	**32.8%**	**2,520**	**25.4%**
Percent of Canada	**100.0%**		**3.9%**		**100.0%**		**2.9**	
Total Sector	**$20,830**	**100.0%**	**$762**	**100.0%**	**262,000**	**100.0%**	**9,940**	**100.0%**
Percent of Canada	**100.0%**		**3.7%**		**100.0%**		**3.8**	

Source: Statistics Canada, Manitoba Bureau of Statistics, cited in.Tarry & Associates, Jan. 1987

4.3 Sector Characteristics

Trade

In 1985 electronic manufacturing and computer software firms (this excludes communication services such as MTS) were surveyed by DRIE and reported that, on average, their markets were largely outside of Manitoba. However, the four largest firm's pattern of trade was radically different from the remaining smaller firms:

% of shipments to	four large firms	remaining small firms	Overall
Manitoba	2.5%	48%	29%
rest of Canada	50%	36%	41%
U.S.	45%	12%	27%
other foreign	2.5%	4%	3%

Only a small fraction of the shipments of the largest firms goes to Manitoba, however almost half of the remaining industry's shipments are for the local market. Similarly large firms ship almost half their products out of Manitoba while the remaining companies ship only about 16% of their products out of province. This difference in trading patterns is partly the result of the out of province control of larger companies (in many cases large branch plants sell only to their parents or affiliates) and partly because of the financial and marketing weaknesses of small firms.[10]

A survey of computer software firms in 1987 showed that about 30% of their revenues came from exports. Over half of the firms surveyed reported making some foreign sales. However most of these were through their own marketing efforts, not through third party distributors[11]. Because of the small

size of most software (and many electronic) firms, resources are often overextended, hampering all aspects of the innovation, application, production and marketing cycle[12]. One-product companies in particular usually lack marketing expertise and are inadequately financed for marketing and distribution[13].

Technology

Manitoba has a broad and diverse base of technology in electronics, communications and computer software however, its diversity means that many areas of technology are only represented by one or two firms.

Although several small Manitoba firms have developed sophisticated products in areas such as farm management software, high speed circuit board design, graphics software, etc. the level of technology is generally higher in the large Manitoba firms. Most small electronic manufacturing firms are several years behind their counterparts in Ontario. It has been estimated that Manitoba electronics firms typically use technology that is five to ten years old[14].

In software however, several small firms have been established with extremely innovative products and a high level of technical expertise.

Investment

Many small firms have the technical expertise and desire to improve the level of their technology but are restricted by lack of financing[15]. Manitoba's software industry especially is largely a cottage industry (57% of firms have fewer than 5 employees)[16]. Access to financing was cited as one of the most critical problems by software firms interviewed in

1987. Attracting venture capital is usually impossible for small firms, in part because of investor's perceptions that such firms have strong technical capabilities but weak management and marketing capability[17].

Exhibit 4.3 shows research and development investments by all industries in the natural sciences and engineering. Nationally, business enterprises supply about 55% of the total research and development spending but in Manitoba they only supply 12%. Since 1981, Manitoba's business enterprises have only contributed around 1% of all Canada's business enterprise research and development spending, although the province's economy (GDP) is about 3.7% of Canada's total.

EXHIBIT 4.3 : NATURAL SCIENCES AND ENGINEERING RESEARCH AND DEVELOPMENT SPENDING, 1985

	Federal Government	Provincial Government	Business Enterprises	Higher Education	Private Non-Profit	Total
Manitoba						
($million)	$88	$8	$21	$55	$5	$177
(%)	49.7%	4.5%	11.9%	31.1%	2.8%	100%
Canada						
($million)	$1,216	$185	$3,330	$1,095	$88	$6,014
(%)	21.9%	3.1%	55.4%	18.2%	1.5%	100%

Source: Statistics Canada, 88-203.

Research and development is essential for economic growth. Although Manitoba industry has a broad technological base and several financially strong firms, they spend less, on average, on research and development of new ideas than firms in Ontario and Quebec. Manitoba is not unique in this: most research and development investment is heavily concentrated

in Ontario and Quebec, which have 70% of the R&D facilities and account for 83% of the business expenditures in R&D Canada. (Ontario and Quebec firms represent 82% of Canada's business expenditures in computer services, telecommunications equipment, electronic parts and components, other electronic equipment and business machine industries)[18].

4.4 Conclusion

Communications and information technologies are among the fastest growing industries in Canada and the world. In spite of an overall trade deficit in electronics and computer services, Canada has a surplus in telecommunications equipment, and some telecommunications services. In Manitoba, the sector has a tremendous diversity and variety of firms, with a few large firms responsible for over half the sectors revenues and employment and 100-200 smaller firms active in a host of fields. Most large firms rely on out of province parent or affiliates for their market while small firms rely more on local niche markets.

In 1984 the Manitoba sector generated about $762 million in revenues and employed about 9,940 people, roughly the same proportion of Canada's communication and information and technology sector as the province's whole economy. Revenues in Manitoba have been growing rapidly in the early 1980's, partly as a result of the establishment of many new small firms and partly from expanded sales from existing firms.

Although some firms (especially software) have highly innovative products, technology used in research and development is low, partly because of the difficulty in attracting private capital and partly because of a dependence (of some firms) on the small local market.

Small Manitoba firms export little of their products and services and are often financially over extended, hampering all aspects of the innovation, application, production and marketing cycle.

FOOTNOTES - SECTION 4.0

1. Department of Regional Industrial Expansion, Manitoba Electronics Industry: Sector Overview, Jan. 1987.

2. cited in InfoTech, Profile of the Manitoba Software Industry, Nov. 1987.

3. Communications Canada, Communications for the Twenty-First Century, 1987.

4. Of these 1984 Manitoba sector revenues, perhaps only 68% represent the value added by the industry (about $516 million in value added which is about 3.4% of Manitoba's GDP in 1984. Compare this with some other Manitoba industries 1984 GDP:

	GDP $ million	GDP % of all industries
Agriculture, hunting, trapping and fishing	$973	$6.5%
Retail trade	825	5.5
Construction	665	4.4
Mining	501	3.1
Food manufacturing	295	2.0
Transport equipment manufacturing	203	1.4
Clothing manufacturing	137	0.9
Forestry	32	0.2
All industries	$14,998	100%

5. Statistics Canada, cited in Department of Regional Industrial Expansion, Jan. 1987.

6. Department of Regional Industrial Expansion, Jan. 1987

7. Tarry and Associates, Background Paper: Opportunities for Manitoba's Telecommunications and Telematics Industry, Jan. 1987.

8. InfoTech Nov. 1987; and Statistics Canada

9. Tarry & Associates, Jan. 1987

10. Department of Regional Industrial Expansion, Jan. 1987

11. InfoTech, Nov. 1987.

12. Department of Regional Industrial Expansion, Jan. 1987

13. InfoTech, Nov. 1987

14. Department of Regional Industrial Expansion, Jan. 1987

15. Department of Regional Industrial Expansion, Jan. 1987.

16. InfoTech, Nov. 1987.

17. Communications Canada,, 1987.

18. Statistics Canada 88-202.

5.0 EVALUATION FINDINGS

This section presents findings for those issues noted in Appendix A which are to be covered in Study #2. Other issues have been covered in other studies of the evaluation.

5.1 Objectives Achievement

5.1.1 Issue 7: Opportunity Creation

Is the program contributing to the creation of opportunities for the people of Manitoba?

To date, approved projects have created a total of about 74 person years of employment directly, of which about 64 person years would not have occurred without the program. Just under three person years of employment have been created indirectly through project purchases of goods and services and induced by consumer spending of direct employee wages and salaries.

Annual forecasts of employment creation likely to occur to 1991/1992 are shown in Exhibit 5.1. By 1991/92 project's sales should be directly providing 108 to 216 person years of employment annually. An additional 137 to 275 person years of employment will be induced or created indirectly. Between 100 and 200 of the direct project jobs and between 55 and 110 of the induced or indirect employment will be located in Manitoba. The remaining 8-16 direct project jobs and 82-165 induced or indirect person years will be created elsewhere in Canada.

EXHIBIT 5.1: EMPLOYMENT IMPACTS (FULL TIME EQUIVALENT OR PERSON YEARS)

Direct Employment	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	Total
Total Project Employment Forecast	16.9	26.1	30.6	83.0	236.6	437.2	622.8	1,455.7
Incremental Project[1] Employment Low Forecast	14.7	22.7	26.6	28.9	61.7	76.1	108.4	341.3
High Forecast	14.7	22.7	26.6	43.3	102.9	152.2	216.7	581.3
- In Manitoba[2] Low Forecast	13.5	20.8	24.3	26.4	56.5	69.6	99.2	312.3
High Forecast	13.5	20.8	24.3	39.6	94.2	139.3	198.3	531.9
Project Purchases								
Incremental Employment from Project Purchases Low forecast	0.2	0.2	1.6	6.8	24.4	52.5	101.7	187.4
High forecast	0.2	0.2	1.6	10.2	40.7	104.9	203.3	361.1
- In Manitoba[3] Low forecast	--	--	0.4	1.5	5.4	11.6	22.4	41.2
High forecast	--	--	0.4	2.2	9.0	23.1	44.7	79.4
Project Employee Consumer Spending								
Incremental Employment from Project Employee Consumer Spending Low forecast	0.1	0.1	0.6	2.4	8.5	18.4	35.7	65.9
High forecast	0.1	0.1	0.6	3.6	1.4	36.8	71.3	126.8
- In Manitoba[2] Low forecast	0.1	0.1	0.6	2.2	7.9	16.8	32.7	60.3
High forecast	0.1	0.1	0.6	3.3	13.1	33.7	65.2	116.0

EXHIBIT 5.1: EMPLOYMENT IMPACTS (FULL TIME EQUIVALENT OR PERSON YEARS) (cont'd)

1 Incrementality was estimated from survey results, to be about 87%. Only about 13% of the impacts would have occurred without the program. Forecasts for Years 1988/89 to 1991/92 also have been reduced from totals to account for the probable success of projects in achieving their forecasts. The following percentages were applied to total forecasts to estimate low and high rates of success:

	1988/89	1989/90	1990/91	1991/92
Low	40%	30%	20%	20%
High	60%	50%	40%	40%

2 Survey results found that on average 91.5% of direct employment was expected to be created in Manitoba, a weighted average of 92% of full time employment and 76% of part time employment. this was applied to both direct employment and project employee consumer spending employment.

3 Survey results found that, on average 22% of their purchases came from Manitoba suppliers.

Of the 18 projects interviewed, 6 are being conducted by enterprises which did not exist before their ERDA project and another two projects are investigations to establish non-profit organizations. Of the remaining 13 projects, were less than 3 years old when they applied for their funding. As shown below, most beneficiaries were relativ new firms.

Year Established in Manitoba

	before 1970	1970-1980	1981-1984	1985-1988
Beneficiaries	12%	23%	18%	47%
Nils	20%	20%	40%	20%

Therefore the program has contributed to the creation of opportunities for the people of Manitoba. Several enterprises were created and to date about 64 direct and induced and indirect person years of employment have been created. Future employment of between 100 and 200 direct project jobs and 55 to 110 induced or indirect jobs in

Manitoba are forecast by 1991/92 as a result of project sales of goods or services.

5.1.2 Issue 8: Infrastructure Improvement

Is the program contributing to the improvement of the infrastructure of the communication and information technology industries?

In our interviews, infrastructure was taken to mean the overall development of the communication industry and respondents were asked their opinions on the impact on the industry's efficiency and the program's effect on overcoming industry problems.

Exhibit 5.2 shows that the majority of beneficiaries feel their projects will improve the efficiency of their firms, their customers, their industry as a whole and other industries.

EXHIBIT 5.2: BENEFICIARIES WHO FEEL THEIR PROJECTS WILL IMPROVE EFFICIENCY (percentage)

	Yes	No	Don't Know	Total
their firms efficiency	60	20	20	100
their customer's efficiency	81	12	6	100
their industries' efficiency	63	6	31	100
other industries' efficiency	56	19	25	100

Exhibit 5.3 shows that the majority of beneficiaries feel the program, program staff and funding assisted them in overcoming problems in the industry. However most nils and industry representatives disagreed, usually because only a few firms in the industries have been accepted by the program. Those not accepted have not felt assisted to the

same extent as those accepted. Some industry representatives felt that a more permanent change in industry financing was required to make any lasting difference and others felt that it is still too early to say whether the program effects will be permanent.

EXHIBIT 5.3: RESPONDENTS WHO FEEL TECHNOLOGY APPLICATION PROGRAM/STAFF/FUNDING ASSISTED IN OVERCOMING INDUSTRY PROBLEMS (PERCENTAGE)

	Yes	No	Don't Know	Total
Beneficiaries	73	27	0	100
Nils	18	73	9	100
Industry Representatives	33	67	0	100
All respondents combined	48	48	4	100

The program has therefore improved the industry infrastructure for beneficiary firms although few firms not receiving funds have yet to see any improvements. If projects succeed as their proponents expect, then most projects will have effects on other members of the industry - improving efficiency, purchasing goods and services and adding to the human resources of the industry. Until then infrastructure improvements will be largely concentrated in the 21 firms receiving funds.

5.1.3 Issue 9: Productivity Improvement

Is the program contributing to the improvement of productivity at the industry level and for the beneficiaries?

In 1984, Manitoba's communication and information technology sector had total revenues of $762 million and employment of 9,940: $76,700 in revenue per employee.

A majority (73%) of beneficiaries feel that their projects will or have improved their firm's productivity. Beneficiaries's total non-project revenues were $78,100 per full time employee in 1987/88. 1987/88 project related revenues were only $8,000 but were forecast to increase to $111,500/project employee by 1991/92 (an increase of about 40% above their 1987/88 non-project revenues/employee).

EXHIBIT 5.4: PRODUCTIVITY MEASURES

	Revenues	Full Time Employees	$/Employee Productivity
1984 Communication & Info Tech. Sector	$762 million	9,940	$76,700
1987/88 Beneficiaries Non Project Total	$366 million	4,680	$78,100
1987/88 Beneficiaries Project Increment	$190.4 thousand	24	$ 7,900
1987/88 Nils Average	$12 million	149	$80,500
1991/92 Beneficiary Project Increment	$12-24 million	108-217	$111,500

Beneficiaries expect that, on average, their non project related revenues will increase by about 40-50% a year, compared with forecast incremental project sales increases of from 180-230% a year. Project related productivity is therefore expected to exceed non project productivity. However, few of these gains have yet to be made - most beneficiaries expect their sales to grow substantially in the future.

At the industry level, productivity gains are also uncertain. Industry representatives were divided in their opinion of the programs effect on productivity. One felt the program had improved productivity, one felt it had not and one didn't

have an opinion.

It is certain that beneficiaries expect to improve their productivity but most gains are still in the future. For the industry as a whole, productivity gains based on survey results are illustrated below.

	Revenue	Employment	$/Employee Productivity
1984 Sector Total	$762 million	9,940	$ 76,700
Add 1991/92 Beneficiary Increment	$12-24 Million	108-217	$111,000
Total	$774-786 million	10,048-10,157	$77,000-77,400
% Change from 1984	+1.6-3.2%	+1.1-2.2%	+0.4-0.9%

Revenue growth is forecast to exceed employment growth among beneficiaries, therefore overall sector productivity should grow by between 0.4 and 0.9% over the seven year period.

In conclusion, productivity improvements as a result of the program are expected but have not yet occurred.

5.1.4 Issue 10: Private Investment Stimulation

Is the program contributing to the stimulation of private investment?

To date, the program's greatest contribution has been the stimulation of private investment. Approved projects have spent a total of about $1.6 million in private investment of which about $1.4 million would not have occurred without the ERDA program. By 1991/92 incremental private investment will reach between $1.3 and $2.7 million annually.

Exhibit 5.5 shows total incremental investment by year to 1991/92. By that date a total of between $17 and 25 million

of investment is forecast to result from the program ($3.8 million to date). About 41-46% of this total will be private investment (37% to date), 24-35% ERDA contributions (53% to date) and 25-30% other government contributions (10% to date).

About two-thirds of beneficiaries feel the program has or will improve their firm's ability to attract private investment and an even higher proportion of nils feel they would have been more able to raise private investment if their projects had been approved. Exhibit 5.6 shows the percent of respondents who feel the program has helped attract private investment.

Most industry representatives do not feel the program has improved the whole industry's ability to attract private investment because most firms in the industry did not receive funding. For firms not receiving ERDA funds, financing is still usually only available from family and friends. No private venture capital mechanism exists in the province

EXHIBIT 5.5: INVESTMENT IMPACTS ($THOUSAND)

	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	Total
Private Investment									
gross investment	88.2	130.2	350.7	1,064.7	3,945.9	5,936.7	7,658.7	7,883.4	$27,058.5
incremental low forecast	76.7	111.3	305.1	926.3	1,373.2	1,549.5	1,332.6	1,371.7	7,046.4
high forecast	76.7	111.3	305.1	926.3	2,059.7	2,582.5	2,665.2	2,743.4	11,470.2
ERDA Contribution	114.9	379.8	846.5	707.3	3,402.9	514.8	--	--	5,966.2
Other Government contribution									
gross investment	35.1	87.6	131.9	191.1	2,507.0	2,592.2	6,251.1	7,049.1	8,845.1
incremental low forecast	30.5	76.2	114.8	166.3	872.4	676.6	1,087.7	1,226.5	4,251.0
high forecast	30.5	76.2	114.8	166.3	1,308.7	1,127.6	2,175.4	2,453.1	7,452.6
Total Incremental Investment									
low forecast	222.1	567.3	1,266.4	1,799.9	5,648.5	2,740.9	2,420.3	2,598.2	17,263.6
high forecast	222.1	567.3	1,266.4	1,799.9	6,771.3	4,224.9	4,840.6	5,196.5	24,889.0

EXHIBIT 5.6: RESPONDENTS WHO FEEL THE PROGRAM WILL/WOULD IMPROVE THE ABILITY TO ATTRACT PRIVATE INVESTMENT (PERCENTAGE)

	Yes	No	Don't Know	Total
Beneficiaries	67	13	20	100
Nils	73	27	0	100
Industry Representative	33	67	0	100
Total	66	24	10	100

which could improve other firm's ability to attract private investment. However, this depends as much on other parts of the economy as on communications and information technology sector. Rates of return are often higher in real estate and private investment will be unlikely to switch to higher risk, lower return investments even if some successes occur.

Exhibit 5.7 shows respondent's opinion on how the program affected the general investment climate. Most beneficiaries feel it has had a positive effect, and even a large proportion of nils feel it has been positive. Most industry representatives feel that it is still too early to say what the programs effect will be, or that the fundamental problem in raising capital remains the same - investors can more easily make money in safer traditional fields.1

EXHIBIT 5.7: RESPONDENTS OPINION OF THE PROGRAM'S EFFECT ON THE GENERAL INVESTMENT CLIMATE (PERCENTAGE)

	Positive	Neutral	Negative	Total
Beneficiaries	73	27	0	100
Nils	44	33	22	100
Industry Representatives	33	67	0	100
Total	59	33	7	100

As projects which did receive funding begin to record significant successes, then a potential demonstration effect is likely which should improve the investment climate but clearly other factors are as important as the sector's own development.

5.1.5 Issue 11: Marketing Improvements

Is the program contributing to improve the marketing of beneficiaries's products or services?

Marketing Benefits

To date, approved projects have spent a total of about $300 thousand on marketing and promotion, of which about $260 thousand would not have occurred without the program. By 1991/92 incremental marketing and promotion spending will reach between $2 to $4 million annually, or roughly 20% of total forecasted project expenditures.

Exhibit 5.8 shows estimated incremental marketing and promotion spending by year for all Technology Application projects.

EXHIBIT 5.8: MARKETING EXPENDITURE IMPACTS ($THOUSANDS)

		1984/ 85	1985/ 86	1986 87	1987 88	1988 89	1989 90	1990 91	1991 92	Total
Incremental Marketing and Promotion Spending	low forecast	--	37.7	109.5	113.0	464.1	975.6	992.2	1,999.7	4,691.9
	high forecast	--	37.7	109.7	113.0	696.1	1,626.0	1,985.5	3,999.5	8,566.4

Beneficiaries marketing efforts are not now primarily aimed at foreign markets. About 12% of their marketing expenditures during their project funding will be spent in foreign markets. However, this is expected to increase after ERDA funding is complete. After their projects, beneficiaries estimate that on average about 39% of their marketing money will be spent out of Canada. By 1991/92 this would therefore amount to between $780 and $1,560 thousand of additional money a year spent in foreign markets.

The additional marketing expenditures outside Canada are largely from firms which had no sales or marketing before their ERDA projects - new, start up companies. Five start up firms, spent no money marketing in foreign countries before their project but on average expect to spend about three quarters of their promotion budgets out of Canada after their projects.

Another five beneficiaries (mostly established firms) were able to estimate the foreign share of their after-project marketing but expected none of their marketing money to be spent out of Canada, thus lowering the overall average to 39%.

Overall, therefore, of the ten firms that could estimate, half expected marketing and promotion spending in foreign countries to increase and half expected them to remain at nothing after their projects.

Another eight beneficiaries did not know what their future foreign marketing expenses were likely to be.

Marketing and promotion budgets have therefore increased because of ERDA projects, largely because many beneficiaries had no marketing outside of Canada (and, in some cases, did not exist) before ERDA.

Sales Revenues

Sales revenues are also expected to increase for beneficiaries. Exhibit 5.9 shows gross sales revenue and the portion of sales revenue which would not have occurred without the program - incremental sales revenue.

EXHIBIT 5.9: SALES REVENUE IMPACTS ($ THOUSANDS)

		1984/ 85	1985/ 86	1986/ 87	1987/ 88	1988/ 89	1989/ 90	1990/ 91	1991/ 92	Total
Gross Project Sales Revenues		-	23.4	24.0	218.8	2,311.4	11,123.8	35,860.6	69,473.7	119,025.7
Incremental Project Sales Revenues	low	--	20.4	20.9	190.4	804.4	2,903.3	6,238.0	12,088.4	22,265.8
	high	--	20.4	29.9	190.4	1,206.5	4,838.9	12,476.0	24,176.8	42,929.9

To date approved projects have had about $266 thousand in sales, of which about $230 thousand would not have occurred without the program. By 1991/92 added sales are forecast to

reach between $12 and 24 million annually. This project related level of sales is equivalent to a 3.5 - 7.0% increase in beneficiaries' existing gross revenues of $366.5 million (a 73.5- 147.0% increase in beneficiaries' existing revenues excluding revenues of Manitoba Telephone).

Of the $230 incremental sales to date, about 35% have been sales outside of Canada, 41% from Manitoba and 24% from sales in the rest of Canada.

The 1985 survey by DRIE noted in Section 4.3 found that, (excluding communications industries such as Manitoba Telephone, broadcasting and cable) electronics and computing software firms exports accounted for about 30% of shipments and sales in Manitoba accounted for 29%. To date, program beneficiaries therefore have a slightly higher proportion of exports and considerably higher share of sales within the province than the rest of the industry.

By 1991/92 however, beneficiaries expect an average of 59% of project related sales will be outside Canada ($7.1 - 14.3 million); 8.5% in Manitoba markets ($1.0 - 2.1 million); leaving 37.5% expected from the rest of Canada ($3.9 - $7.9 million). These forecasts are dramatically different from existing trade patterns.

In summary, the program has had slight effects on the amount of money spent on marketing (an additional $260 thousand) and on additional sales ($230 thousand) to date. However, forecasts show marketing expenditures should reach between $2-$4 million annually by 1991/92, a considerable increase over current industry levels. An increasing share of marketing is expected to occur in other countries, which beneficiaries hope will lead to a dramatic shift in trade patterns for the industry.

5.2 Impacts and Effects

5.2.1 Issue 12: Economic and Financial Indicators

What is the actual situation of the sector with regard to the main economic and financial indicators?

Section 4.0 outlined the sector's major characteristics.

In the sector, revenues were $762 million in 1984. The previous year, excluding Manitoba Telephone, average revenues per firm were $4.3 million. Annual growth in revenue averaged about 12.6% a year from 1978 to 1982 for all electrical and electronic manufacturing firms and 30% a year from 1981 to 1984 for computer service firms (excluding computer leasing/rental firms), a very healthy rate of growth. Since the recession of the early 1980's the sector has experienced steady growth, both before and during the program.

The average total revenues of project beneficiaries presently is $26 million a year ($1.3 million a year excluding Manitoba Telephone). The average revenue of nils interviewed is presently $12 million a year ($2.4 million a year excluding the largest nil). Exhibit 5.10 shows the distribution of beneficiaries and nils by their current annual revenue. Beneficiaries are evenly distributed among the various revenue size groups while a slightly higher proportion of nils are in the lowest and highest revenue size groups.

EXHIBIT 5.10: RESPONDENTS CURRENT ANNUAL GROSS REVENUES (PERCENTAGE)

Revenue	Beneficiaries	Nils
$0	28.6%	30%
$1 - $100 thousand	21.4%	10%
$100 thousand - $1 million	21.4%	10%
over $1 million	28.6%	40%
Total	100%	100%
Average Revenue ($ million)	$26.0 m	$12.0 m
- excluding the largest	$1.3 m	$2.4 m

Employment

Employment has generally grown along with sector revenues however almost all of the increase has been in computing services and electronics manufacturing. Software development firms alone were expected to increase their employment by an average of 10% a year in 1987. Employment in communication services has been mostly static or declining.

Exports

In 1985 electronic manufacturing and computer software firms (communication services do not export a large portion of their services) reported that overall 30% of their shipments were to outside of Canada. Most exports are by the largest firms: while small firms export only about 16% of their shipments, large firms export almost 48%. Computer software firms alone estimated in 1987 that about 30% of their revenues came from exports however most small firms face

tremendous obstacles to exporting, including lack of financing and lack of marketing expertise.

Investment

Most large firms have considerable financial strength but lack a mandate for new product development. Smaller firms have the technical expertise and desire to improve their technology but lack financing. Software development especially is largely a cottage industry and attracting venture capital is usually impossible because of investor's perception that they lack managerial and marketing capability.

Manitoba businesses supply only 12% of the spending in all natural science and engineering research compared with 55% for Canadian business. The Manitoba communications and information technology sector spends much less, on average, on research and development than the Ontario or Quebec sector, Ontario and Quebec account for 82% of Canada's business expenditure on research and development in the sector.

5.2.2 Issue 13: Economic and Industrial Problems.

What are the major economic and industrial problems in the sector?

Most of the firms and industry representatives interviewed for this evaluation reported that lack of capital and lack of marketing expertise were the major problems now facing firms in the sector. Exhibit 5.11 shows the percent of responses for the problems noted by those interviewed. In many ways these problems are typical of small, start up firms anywhere in Canada and as many in the sector are new start up

companies their problems dominate. As noted previously however, a handful of large firms in Manitoba have financial backing and are skilled in volume production and marketing but often lack a mandate to begin new product development.

EXHIBIT 5.11: COMMUNICATION/INFORMATION TECHNOLOGY SECTOR PROBLEMS

	Percent of Responses
Lack of capital/difficulty raising money	21
Lack of marketing/customer support	11
Lack of supply/distribution infrastructure	11
Reluctance by customers to adopt new technology	11
Firms afraid of risk/lack ideas	9
Lack of experienced competent staff	7
Industry too diverse/few firms in industry	5
Lack of managerial experience/administrative controls	4
Small/narrow market in Manitoba	4
Sales too low to cover costs	4
High R&D/manufacturing costs	4
Software theft/lack of software content	4
Other	7
	100%

InfoTech, in their 1987 survey of software developers found that over 60% of firms reported three major inhibitors to growth:

- poor marketing expertise;
- attracting venture capital; and
- penetrating export markets.

InfoTech concluded that, while small in numbers, software developers had significant maturity and technological and application strengths. InfoTech has designed their strategy to concentrate on these three areas of need. InfoTech recommended both continued government stimulus and assistance through government procurement and direct financial support to lower investment risks.[2]

Many industry representatives have argued that increased joint ventures between small and large Manitoba firms could both increase the level of R&D and improve the products produced in Manitoba by combining their complementary talents and skills.[3]

A focus group meeting of several firms and an industry association representative reviewed the preliminary findings of the evaluation and discussed industry problems with the study team. Lack of financing, lack of ability to do market planning, lack of marketing and distribution infrastructure and lack of new product development were all confirmed as major industry problems. In all high technology fields a gap exists between the research and the commercial development of new products.

A lack of financing for this stage (prototype development, pre production design and planning, market research, etc.) is still the industry's major problem. To attract financing, credible market studies and detailed marketing plans are needed. New products or services must be demonstrably profitable before investors will support them. Market planning is therefore a prerequisite for obtaining financing.

Small start up firms require much more than funding alone. They require expertise, advice, space and services as well as financing. Existing firms also require more than simply financing however they usually do not need the incubation type services needed by start up firms.

5.2.3: Issue 14: What are the incremental effects of the program on output, productivity, employment, private investment and marketing activities?

Output

As discussed in Section 5.1.5 project related sales revenue has so far added a total of only $230 thousand to the sector's output but is projected to add between $12 and $24 million a year by 1991/92. This 1991/92 incremental sales revenue is equivalent to about 3.5% - 7.0% on top of beneficiaries' current revenues and about 1.5% - 3.0% on top of the total revenue of the whole sector in 1984.

This revenue translates into a value added or gross domestic product increase of $13 - $26 million a year by 1991/92 (See Appendix C), $8-$16 million directly in beneficiary firms, $3.5 - $7 million in firms supplying goods and services to beneficiaries and $1.6 - $3 million in firms supplying consumer goods and services to project employees. Of this Canadian GDP impact, most would be felt in Manitoba. Manitoba GDP in 1991/92 will be increased by from $10-$20 million. The total added GDP is about 2.5% - 5% of the whole sector's estimated GDP in 1984, before the program.

Productivity

As discussed in Section 5.1.3, beneficiaries have not yet experienced many incremental productivity gains from project activities but sales are expected to increase productivity from $78 thousand per employee to $112 thousand per employee by 1991/92, a 40% increase. When incremental project sales and employment are added to 1984 sector total revenue and employment the sector as a whole, the sector's productivity will increase by between 0.4% and 0.9% between 1984 and

1991/92 as a result of the program.

Employment

As shown in Section 5.1.1, direct incremental employment to date has totaled about 64 person years. Another 3 person years have been created either through indirect project purchases or induced from project employee consumer spending.

By 1991/92 annual direct employment added is forecast to add between 108 and 216 person years and indirect and induced employment will add another 137 to 275 person years. Between 100 - 200 direct and 55 - 110 indirect and induced person years will be located in Manitoba. Manitoba's total sector employment will therefore increase by 1-2% as a result of the program.

More important than employment creation however, is the maintenance and enhancement of technical skills in the province. A number of firms and industry representatives noted that although the numbers of jobs created in high technology industries are small, the quality of these jobs is high (high wages, high skill levels) and that attracting experienced staff is a real problem in the industry. Many graduates of Manitoba technical schools and universities must leave the province to find work in high technology fields. Projects have provided a means of retaining more of these graduates in the province and enhancing their knowledge of the state of the art in their fields.

Private Investment

As discussed in Section 5.1.4, private investment has shown the greatest increase to date as a result of the program and is forecast to continue to add to the sector's capital base.

Most beneficiaries have found that the ERDA project contribution lowers the perceived risk of investment and increases their ability to raise money.

Private investment has already added about $1.4 million to the Manitoba economy which would not have occurred without the program. By 1991/92 private investment is projected to reach $1.3 - $2.7 million a year, an increase of 4% - 13% on Manitoba's total 1985 private investment in R&D in all industries in the natural science and engineering field.

Beneficiaries and their partners and investors have made and expect to make considerably more investment than before the program. About 67% of beneficiaries feel the program has or will increase their ability to attract private investment and 73% feel the program has or will improve the general investment climate in their industry Even 44% of nils feel the general investment climate has or will improve because of the program.

However, industry representatives warn that permanent changes in the province's private investment climate will depend on the success of projects funded and that the effect on firms not receiving funding have not yet been felt. The program has definitely helped beneficiaries but the rest of the industry has not felt any improvement yet.

Marketing Activities

Section 5.1.5 shows that to date about half of the program beneficiaries have undertaken some kind of marketing or public relations activities for their projects. This has resulted in about $300 thousand in marketing and expenditure, about $260 thousand of which would not have occurred without the program. By 1991/92 added marketing and promotion

spending is forecast to reach between $2 and $4 million annually.

However, most of the added marketing expenditure will be spent by new start up companies therefore the program cannot be credited with greatly increasing the marketing budgets of existing firms.

5.2.4 Issue 15: Diversification

Is the program promoting the diversification of activities in the industry?

Beneficiaries are active in a number of unique fields but Exhibit 5.12 shows that a substantial number are also in areas that have existing Manitoba firms. More beneficiaries than nils said no other firms operated in their field in Manitoba.

EXHIBIT 5.12: RESPONDENTS WHO FELT OTHER FIRMS IN MANITOBA OPERATED IN THEIR SAME FIELD (PERCENTAGE)

	Yes	No	Total
Beneficiaries	38	62	100
Nils	60	40	100
Total	46	54	100

Exhibit 5.13 lists the types of fields of beneficiaries. About 50% of beneficiaries are operating in the computer service industry (software development, data processing and other information services), 6% in electronic manufacturing, 13% in the telecommunications services, 19% in consulting and 13% are investigations to establish joint public-private research centres.

About 60% of beneficiaries feel that the program has or will improve the diversification of their industry. Exhibit 5.14 shows the percent of respondents who feel the program has promoted diversification.

EXHIBIT 5.13: BENEFICIARIES FIELDS (PERCENT OF BENEFICIARIES)

	%
Telecommunication services	13
Data processing	6
Software development	31
Consulting	19
Other information services	13
Electronics manufacturing	6
Research	13
	100

EXHIBIT 5.14: RESPONDENTS WHO FEEL THE PROGRAM HAS/WILL IMPROVE THE INDUSTRY'S DIVERSIFICATION (PERCENTAGE)

	Yes	No	Don't Know	Total
Beneficiaries	60	13	27	100
Nils	27	27	46	100
Industry Representatives	33	67	0	100
Total	45	24	31	100

Although most industry representatives disagreed, this was because they did not think diversity was a problem for Manitoba's industry. In some ways the Manitoba industry is too diverse already, with too few firms in any particular fields. A common complaint in the industry is the lack of depth in various fields. Some respondents felt the program has helped precisely by focussing several firms in complementary activities, adding to the resources available

in certain areas - for example, expert systems or health care.

The program has helped establish many new businesses in unique fields and has assisted existing firms expanding into new areas of business. Therefore the program has promoted diversification. However, diversity is not widely regarded as a proper objective for the program because of the existing diversity in Manitoba. The program has sponsored more than one project in areas like expert systems, electronic publishing and health care applications in order to add depth to the Manitoba industry.

EXHIBIT 5.15: RESPONDENTS WHO FEEL THE PROGRAM HAS/WILL/WOULD IMPROV TECHNICAL OR MANAGEMENT SKILLS (PERCENTAGE)

	Yes	No	Don't Know	Total
Beneficiaries	67	20	13	100
Nils	46	36	18	100
Industry representatives	33	67	0	100
Total	55	31	14	100

5.2.5 Issue 16: Managerial Skills

Is the program contributing to the improvement of the management skills of beneficiaries?

About two-thirds of beneficiaries feel the program has or will improve the technical or management skills of their firm. Exhibit 5.15 lists the opinions of nils and industry representatives as well. (Nils were asked if the project would have improved their skills had they received funding).

Half of the beneficiaries who cited improvements referred to improved technical skills.

Firms were required to put together business plans to qualify and, as some of the applicants had no experience in planning, the discipline imposed was beneficial. Others (especially those not approved) resented this process and felt that the requirements were too vague and the effect on their skills was negligible.

The industry representatives who feel the program has not improved the skills in the industry usually felt this project application process, by itself, was not sufficient to change firms with poor management or poor technical skills.

In conclusion then, the program appears to have improved the management skills of some beneficiaries - about 33% of beneficiaries felt the program had improved their management skills, 20% improved their technical skills and 13% improved both technical and management skills. However not all beneficiaries saw a benefit, and the program application process alone is not sufficient to address the lack of management skills in the industry. The program did not attempt to duplicate existing management training programs but has attempted to refer applicants to others for expertise they lack.

5.2.6 Issue 17: Export Activities

Is the program contributing to the improvement of export activities?

Section 5.1.5 discussed the increase in marketing in foreign countries and found that by 1991/92 between $780 and $1,560 thousand /year of added marketing expenditures will be made outside of Canada as a result of the program.

However, most of this added foreign marketing was forecast by the new startup firms receiving funding from the program. Established firms who could estimate their foreign marketing expected none of their marketing to be out of Canada.

Therefore, although the program is forecast to increase foreign marketing efforts, the increase is all from firms which had no marketing outside Canada before the program. Established firms have not increased their foreign marketing as a result of the program.

Export sales to date have totaled only a few thousand dollars however sales forecasts by beneficiaries are largely generated by export sales. By 1991/92, beneficiaries expect exports to reach 59% of total sales; between $7.1 and $14.3 million a year in added sales are expected to be from outside of Canada, dramatically different from existing industry experience. Most of these projected export sales were forecast by the new start up firms interviewed. Established firms were either unable to forecast their future sales or unable to estimate the proportion of export sales. This implies that export projections are more uncertain than for projections of either future sales or export percentages alone.

The program has and will mainly increase the export marketing and sales of new start up firms. Established firms receiving funding were not as able to forecast their future export sales as new firms, implying that the future export effects of the program are uncertain.

5.2.7 Issue 18: Financial Situation

Is the program contributing to the improvement of the financial situation of beneficiaries?

Because of the program, over two-thirds of beneficiaries feel they are better able to attract private investment and almost three quarters felt it has improved the general investment climate in their industry. Beneficiaries' financial situations have improved because of their ERDA contributions and even about 44% of nils feel the program has improved the industry's general investment climate.

Profitability measures are much more difficult to determine than access to capital. Only four beneficiaries were able to estimate their expected gross profit from projects although another three have gross profit targets (from 12% to 40% of sales) they hope to achieve. Four beneficiaries reported their projects lost money (two would continue operating without profits - one is a proposed non-profit research centre where profits would be made by firms sponsoring research at the centre, not by the centre and another explained that their product could not be profitable because it involves social benefits only; and two have cancelled their projects as they were no longer viable) and two beneficiaries expected their projects would not be profitable for four to five years. Five beneficiaries were unable to forecast whether or when they would be profitable or how much profit they would make.

The financial situation of new start up firms is usually precarious. They often needed ERDA contributions to begin operating in the first place therefore, the program has not so much improved their financial situation as allowed them to exist.

Established companies able to experience improved financial situations report that the program's major effect has been to lower the risk of investment in new product development, and most expect that the products they develop will improve their firm's situation. Only four firms have already experienced sales; therefore the benefits for most beneficiaries lie in the future.

Economic impact calculations in Appendix C were derived from survey results. Beneficiaries forecast that, on average, wages, salaries and benefits, and purchases of materials, supplies and services constituted 69.9% of sales. The remaining 30.1% of revenues is therefore assumed to represent capital surplus (gross profit before taxes plus interest payments plus depreciation).

Using 30.1% of revenues as a guide, the capital surplus generated by sales to date have been only about $70 thousand. However by 1991/92 annual capital surplus from forecast revenues will reach between $3.6 and $7.3 million. While much of this will be required to service debt and cover depreciation (the exact amount is not known) a portion will remain as profit, and will enable continued reinvestment for industry expansion in the future.

In summary the program has contributed to the improvement of the financial situation of beneficiaries. Most beneficiaries and many nils feel the program has improved the investment climate, and most beneficiaries have had better access to capital because of the program. Profitability has not been improved yet in more than a handful of beneficiaries, but forecasts of sales indicate that profits will increase in the future.

5.2.8 Issue 19: Manitoba Content

Is the program contributing to an increase in Manitoba's content in the output of beneficiaries or output of their clients?

Because sales to date are still small, no significant increase in Manitoba content has been experienced yet. Future sales will increase Manitoba content to the extent that the products or services sold contain inputs from Manitoba. Beneficiaries were therefore asked what portion of their products or services inputs (investment, labour and materials and equipment) were produced in Manitoba. Exhibit 5.16 shows the percent of beneficiaries responding, by percentage of inputs, and the average (for those able to estimate) proportion of each input before and after their projects.

For example, before their projects 6% of beneficiaries purchased between 50% and 99% of their materials and equipment from Manitoba producers. All beneficiaries together bought an average of 9% of their material and equipment from provincial producers.

Although the average proportion of Manitoba inputs will increase after their projects (for example from 9% to 22% for material and equipment), this increase in the average is caused by only three beneficiaries, none of whom existed before their projects.

Therefore, although more Manitoba inputs are likely to be used as a result of the program, all of the increase is from the start up of new firms. Existing firms do not expect to change their source of material, labour or investment because of their projects but will, because of increased

sales, purchase more inputs in total, which will increase Manitoba content.

In summary, because respondents are very divided in their pattern of inputs (some purchase little or nothing from Manitoba and some purchase almost everything from Manitoba) and because the increase in Manitoba inputs after the project is caused by only three firms, there is not enough evidence to conclude that Manitoba content will be affected by the program, except by the natural increase caused by growing sales of project products and services. Sales forecasts are shown in Exhibit 5.9.

EXHIBIT 5.16: PORTION OF BENEFICIARIES INPUTS PRODUCED IN MANITOBA (PERCENTAGE OF BENEFICIARIES)

Portion Produced in Manitoba	Before Project			After Project		
	materials & equipment	labour	investment	materials & equipment	labour	investment
Not applicable	17	17	17	11	11	11
Don't know	22	17	17	39	28	28
0%	50	17	28	28	—	11
1-25%	6	—	—	11	—	11
26-50%	—	—	—	—	—	6
50-99%	6	—	—	28	—	—
100%	—	50	39	—	61	33
Total	100%	100%	100%	100%	100%	100%
AVERAGE PERCENT PRODUCED IN MANITOBA	9%	75%	58%	22%	100%	60%

5.2.9 Issue 20: Distribution of Benefits.

Is the program's contribution benefitting all social groups?

Respondents were asked if they felt program funds had been distributed proportionately among:

- all types of eligible fields;
- large and small firms; and
- all ethnic and social groups (women, Natives, francophones).

Exhibit 5.17 shows respondents opinion on these three aspects. The majority of all types of respondents do not know if funds have been proportionally distributed. Most beneficiaries, nils and industry representatives do not know which applicants received funding and therefore cannot say whether they represent all fields, firms sizes or ethnic and social groups. There has not so far been enough publicity on projects funded to make people aware of any serious disproportion of funding. However, this indicates a lack of program publicity which is discussed in Section 5.2.11.

From our review of projects receiving funding, all eligible fields and both large, medium and small firms are represented; however not all ethnic and social groups are represented.

The communications and information technology sector has generally had less minority group and female participation than other industries. This has historically been true of much natural science and engineering research and development, throughout Canada. New immigrant groups and women are increasingly entering these professions and the traditional dominance of white males is unlikely to remain

for many more years. However, these changes are part of a larger social change. The program has not made any attempt to set this as a criteria for the selection of projects and so has not had any effect on the increased participation of women or minority ethnic groups in the industry.

EXHIBIT 5.17: RESPONDENTS WHO FEEL FUNDING HAS BEEN ALLOCATED PROPORTIONATELY (PERCENTAGE)

Among all types of eligible fields

	Yes	No	Don't Know	Total
Beneficiaries	0	13	87	100
Nils	0	27	73	100
Industry representatives	33	0	67	100
Total	4	17	79	100

Among large and small firms

	Yes	No	Don't Know	Total
Beneficiaries	27	7	67	100
Nils	0	9	91	100
Industry Representatives	33	0	67	100
Total	17	7	76	100

Among all ethnic and social groups

	Yes	No	Don't Know	Total
Beneficiaries	6	7	87	100
Nils	9	0	91	100
Industry Representatives	0	0	100	100
Total	7	4	90	100

The program did set criteria on firm size. The Technology Applications Steering Committee decided that a mixture of small start up firms and medium sized firms should be selected. As noted in Section 5.1.1, most beneficiaries are relatively new firms, with 47% being established in Manitoba

since 1985.

Exhibit 5.10 showed that beneficiaries were evenly divided among various existing revenue groups, reflecting the Committee's desired mixture. About 29% have no revenues, another 21% have under $100 thousand, 21% have between $100 thousand and $1 million and 29% have over $1 million in revenue. Although this distribution of benefits may be proportional, some industry representatives feel that too much of the benefits went to small start up firms while others felt that too much went to large established firms. They felt, in other words, that the benefits should not have been distributed proportionately but should be targeted more to the specific needs of small start up or large established firms. This will be discussed further in Section 5.3.2.

In summary, respondents generally did not know enough about projects funded to say whether benefits were distributed proportionately. From our review of projects it appears eligible fields, and large and small firms received relatively proportional funding. Various ethnic and social groups did not, and this was not a criteria of funding.

5.2.10 Issue 22: Program Delivery

Is the program's management providing fast delivery of the program?

Exhibit 5.18 shows the average number of weeks for each stage of the process: overall, the entire process averaged 30 weeks. Exhibit 5.19 shows the proportion of beneficiaries by the number of weeks taken: about 36% took under 25 weeks, 45% took 25 to 40 weeks and 18% took over 40 weeks.

Half of respondents are satisfied with the speed of this process and half are dissatisfied as shown in Exhibit 5.20. About one third of delays cited were between receiving the project authorization and getting the contribution agreement; about one-quarter of delays cited were between submitting the full proposal and receiving the authorization; and just under one-fifth of delays cited were between initial requests and full proposals. The causes of delay cited by beneficiaries include:

- each step in negotiation requires committee approval
- no delegation of authority from committee to program managers
- committee doesn't meet often enough
- split in authority between Ottawa and local committee
- staff changes at DOC
- had to fly out people from DOC Ottawa to negotiate
- no tracking of projects
- no written confirmation of decisions (approval or rejection)
- takes time to build consensus on committee.

Because of the flexible criteria and the complexity of the projects, some delay is necessary to fully develop proposals, assess their likelihood of success and negotiate program contributions and other partner's participation. Some delays were caused by a lack of preparation of the applicants themselves.

However, in fast changing fields such as communication and information technology, a few months is critical to business success. One project which did not proceed was cancelled at least partly because of delays in the approval process (but in the proponents opinion, no economic benefits were lost as the project would not have produced any benefits if it had proceeded, because of changing marketing conditions) and several which did proceed complained that the delay caused

them financial hardship, probably slightly delaying the economic impact of the program.

EXHIBIT 5.18: SPEED OF PROGRAM DELIVERY

	Beneficiaries Average Weeks	Percent of Complaints about Delays Beneficiaries (%)	Nils (%)
First contact to initial request	3.7	5	10
Initial Request for Full Proposal	4.1	19	30
Full Proposal to Authorization	14.9	27	50
Authorization to Agreement	7.8	33	10
Agreement to Receiving Funds	6.4	14	10%
		100%	100%

First Contact to Receiving Funds[1] 29.9 weeks

1 If funds have not yet been received, time was calculated up to last stage completed therefore total time will be larger once all projects are underway. For those projects completed or now underway the average time to receiving funds has been 35.7 weeks.

EXHIBIT 5.19: BENEFICIARIES TOTAL TIME FROM FIRST CONTACT TO LAST STAGE COMPLETED

Total Weeks	Percent of Beneficiaries
8-16	18
17-24	18
25-32	27
33-40	18
41-56	18
Total	100%

EXHIBIT 5.20: RESPONDENTS SATISFIED WITH SPEED OF DELIVERY PROCESS (PERCENTAGE)

	Yes	No	Don't Know	Total
Beneficiaries	47	53	0	100
Nils	50	50	0	100
Industry Representatives	67	33	0	100
Total	50	50	0	100

5.2.11 Issue 23: Awareness of Program

Is the public aware of both government's contributions to the various projects?

Most beneficiaries themselves were not aware of what projects received funding from the program (as discussed in Section 5.2.9). Therefore many naturally did not feel their industry was aware of both government's contributions. Exhibit 5.21 shows that roughly half of beneficiaries, one third of nils and two thirds of industry representatives felt their industry was not aware of both government's contribution. Most thought this was because the provincial government did not contribute money to the Technology Applications Component of the Agreement. As the federal government administered the program, and coordinated the application process and all public announcements, the province's role is not widely known.

EXHIBIT 5.21: RESPONDENTS WHO FEEL THEIR INDUSTRY IS AWARE OF BOTH THE FEDERAL AND PROVINCIAL CONTRIBUTIONS TO THE PROGRAM (PERCENTAGE)

	Yes	No	Don't Know	Total
Beneficiaries	47	47	7	100
Nils	27	36	36	100
Industry Representatives	33	67	0	100
Total	38	45	17	100

The Technology Application Steering Committee decided in late 1987 not to issue any publication on the component's projects until the program was complete, with all projects funded underway and producing results. However, in spite of little publicity on individual projects, the Steering Committee did undertake a large, well attended Mid-Term Strategic Review Workshop in Brandon February 8-10, 1987. Workshop participants from 20 companies and the federal and provincial government presented and discussed over 100 ideas on how to best use funds in Manitoba. To alleviate the lack of awareness cited at the workshop, the Steering Committee adopted several actions:

- developed a Guide for the Submission of Proposals for widespread distribution;
- used industry forums to publicize the program (speaking engagements, etc.); and
- ensured that information about ERDA funding was made available to all funding agencies, both federal and provincial and ensure that liaison between these agencies was promoted.

A consultant was hired to help publicize the program and encourage submission of new proposals. In all, 167 firms were contacted by telephone, of which 116 were determined to

not be qualified or interested. Of the remaining 51, two decided not to pursue the application and 49 were referred to DOC for an initial verbal discussion. Seven of these have received project authorization to date.

Half of beneficiaries have so far begun public relations or marketing activities of their own and two-thirds of these have specifically mentioned the ERDA funding received in their marketing material. This has been too little to increase awareness of both government's contribution but marketing should increase awareness in the future.

In summary, although the program initially was not widely known among the industry, after the 1987 Mid-Term Review and subsequent proposal stimulation project, most in the industry became aware of the program and many applications were received. Awareness of the program is now high, although the provincial contribution is not known because of the federal administration of the program and the lack of direct provincial funding. Little project marketing has occurred yet, so even though most beneficiaries mention the program in their own marketing documents, the public has not yet been made aware of the program's contribution to individual projects.

5.3 Alternatives

5.3.1 Issue 24: Program Effectiveness

Is the Agreement formula the most effective mechanism to achieve the expected objectives and impact?

After reviewing the objectives of the Sub-Agreement with respondents, they were asked if they thought the present program was the most effective mechanism to achieve those

objectives. Exhibit 5.22 shows that the majority of beneficiaries and industry representatives and all program managers feel it is the most effective mechanism. A majority of nils and one third of beneficiaries disagree however and their reasons vary greatly:

- too much Ottawa control/not enough local resources;
- procedures unclear/slow/uncertain/complex;
- not enough commercially viable projects chosen;
- not enough funding for marketing in projects;
- only tax cuts can create permanent jobs; and
- need interest free loans to discourage non commercial projects.

Only the last two reasons given actually question the mechanism of the program. Most people who felt the program was not the best mechanism were in fact concerned with the way the program was delivered, not the basic formula of promoting economic development by matching contributions. In general, therefore, the formula is seen to be the most effective mechanism to achieve the expected objectives and impacts.

EXHIBIT 5.22: RESPONDENTS WHO FEEL THE PRESENT PROGRAM IS THE MOST EFFECTIVE MECHANISM TO ACHIEVE THE EXPECTED OBJECTIVES AND IMPACTS (PERCENTAGE)

	Yes	No	Don't Know	Total
Beneficiaries	65	33	7	100
Nils	18	64	18	100
Industry Representatives	67	0	33	100
Program Managers	100	0	0	100
Total	53	35	12	100

5.3.2 Issue 26: Program Improvements

Could the program be improved in order to meet the needs of the sector?

There is general agreement that help is still needed to attract financing for new product or service development and the formula of lowering the risk of investment by contributions of some kind is widely accepted as necessary. As well, many respondents complemented the way DOC staff and the province helped them develop their ideas and encouraged them. Nevertheless future programs could be improved and several ideas were given.

Improvements suggested by respondents are listed in Exhibit 5.23. Each of these suggestions should be seriously considered in any future programs.

Program Delivery

Firms need a clear cut process that is fast and understandable. The need for negotiation and the likely time for decision making should be explained in program literature. There is little disagreement that the speed of the delivery process should be improved: this could be accomplished through more frequent Steering Committee meetings, more written confirmation of decisions and more local analysis. The Winnipeg DOC office total staff time devoted to the ERDA Subsidiary Agreement was:

	1985/86	1986/87	1987/88
Person years	2.6	2.2	2.7

As this includes all Components of the Subsidiary Agreement, only about one person year annually has been devoted to program development for the Technology Application Component.

This has not been sufficient to both publicize the program and help develop proposals. Many applicants were unable to get quick decisions on their proposals because negotiations required more staff resources than were available.

Even the project monitoring phase of the program now underway will require local staff resources, and the Steering Committee has noted that local staff resources may not be sufficient to provide the administrative and technical services needed by beneficiaries. To ensure that beneficiaries needing help are not overlooked, the program should ensure that adequate staff are available locally to monitor projects progress. Without local resources to monitor projects, the program is in some danger of being unable to ensure that, as conditions change, projects remain viable.

EXHIBIT 5.23: SUGGESTED IMPROVEMENTS

Program Delivery

1. faster decision making
2. more written decisions to avoid confusion
3. more local analysts and program development staff.

Selection Process

4. fewer high risk projects/more commercially viable projects
5. more specific/clearer/more consistently applied criteria
6. more publicity of program to generate more projects to choose from
7. more funding for new start up firms.

Others

8. tax credits or interest free loans instead of contributions
9. make easier to change forms of project after approval
10. support with more funds for marketing
11. sliding scale of funding tied to results of projects
12. support partnering with customer firms outside Manitoba

Selection Process

The selection process has many potential areas of disagreement. Some of the selection process suggestions are contradictory. While many felt that new start up companies could be better served through incubator type programs and that too many of the projects funded are new start up companies, other feel the program has funded too many projects for established firms that have the resources to put together the matching investments required.

Both points of view are partly correct. The Steering Committee chose to fund a mixture of new and existing firms. Future programs should not specifically set targets for funding new vs. established firms as it is not possible to predict which group of firms will generate the best ideas. However, new start up firms require more than simply funding to succeed and the same criteria cannot be applied fairly to both new and existing firms. This should be recognized in future programs.

Commercial viability has been one of the criteria applied in the project selection process. Funding new start up firms usually means taking greater commercial risks than funding established firms. They require advice, expertise, hard work and resources to simply establish, and while future programs should not ignore these needs, they should avoid duplicating the many existing services for new firm start ups. Future programs should not focus on providing incubation type services but on providing assistance in the commercial application of new products and services - not on establishing new firms but on developing commercial products and services - not on providing operating income for new companies but on providing project funding. Start up

companies with viable ideas should be funded but other programs should be used where possible to provide staff and operating income.

Future programs could benefit from the lessons learned by the existing program. The Steering Committee found that the first step should have been to discover what the industry needed (which they did only after a few years into the program at the Brandon Workshop) and to concentrate on publicizing the program early. In this way the industry helps set the objectives of the program and, at the same time, is made aware of the process. Also, publicity helps to generate applications and the more applications the Steering Committee received, the better the likelihood that they could choose successful projects. More applicants also means more staff resources needed to analyze and negotiate on behalf of the Steering Committee.

At least some of the confusion about the program's criteria arose because of the different way the Steering Committee operated after the Brandon Workshop and the publicity to generate applications in 1987. More applications were received than in the earlier years of the program and some applicants complained they had been rejected while other projects had received earlier funding in the same field. The Steering Committee simply had more applications to choose from in 1987 than in 1985 and 1986 and hence were more likely to reject applicants. An earlier publicity campaign in future programs would eliminate this problem, as program managers noted.

Other Suggestions

Alternatives to contributions should also be considered for future programs - and even contributions could require more

private investment leverage for projects which are more fully developed and less leverage for those which are in the early stages of commercialization. Possible payback of contributions could be tied to future sales for projects in the later stages of their development. The program would benefit from successful projects and the program funds could be reinvested in other projects resulting in more beneficiaries.

The optimal size of future programs funding should not be lower than the $5.9 million authorized for the existing program. This program received far more applications than they had funding to assist so less money would result in an even higher number rejected. How much more depends largely on the ability of the industry to generate their own investment. This is still largely unknown, and will depend on the success of the projects now funded - as well as the larger taxation and research policies of both governments.

Once projects are selected and approved, market or technology changes beyond the control of the firm often require refocussing of projects. Some beneficiaries noted that under their existing contribution agreements, changes in focus often meant they were considered in default of their agrement and lost their holdback portion (as well as the remainder of their contribution). Some simple method of monitoring projects should be developed that allows changes in focus or even stopping projects partway if the market or technology environment has changed so that the project is no longer viable - but without defaulting on the agreement.

Marketing was a recurrent theme throughout this evaluation. While beneficiaries were often thankful that this program funded any marketing activities, even more was felt to be needed. The industry lacks market planning, a distribution

infrastructure and marketing expertise. Credible market feasibility studies are essential for firms to attract the private investment needed to develop ideas into prototypes and to develop prototypes into products. A marketing and distribution plan is needed to attract investment to manufacture products and are essential to actually begin selling. Future programs should include market planning together with every stage of technical development in any projects approved. Market planning should be done concurrent with, not after, product development. Market planning can also be used as a method of project monitoring, with program managers reviewing each projects viability regularly by milestone marketing plans and sales projections.

Partnering between firms, one of the goals of the Steering Committee, was often cited as an important factor for any future programs. Partnering with firms outside Manitoba and with customer firms gives Manitoba companies a much better chance to succeed. Some respondents suggest that all projects should be required to have partners - partnering with customer firms for example, where the customer contributes to the product development in return for a royalty or percentage of future sales, ensures market testing will be done, lowers the perceived risk for other private investors and improves the viability of projects. Requiring private sector partnerships would also allow market mechanisms to select areas of technology for priority, although specific opportunity areas could still be suggested by program managers.

In summary, there are several areas of improvement which should be considered when designing future programs:

- a faster, clear cut delivery system;
- publicity early on in the program;
- avoid funding ordinary operating expenses of new firms;
- repayable or more highly leveraged contributions for projects in later stages of development
- allow changes in project focus;
- include market planning at each stage of technical development in projects;
- increase support to projects with private sector partners.

5.4 Conclusion

The program has only partly achieved its objectives but should achieve them within a few years as projects are completed.

The program has to date, contributed to the creation of a few jobs and new enterprises; it has improved the industry infrastructure, greatly stimulated private investment, but increased the sales revenues and marketing expenditure of the industry only slightly. Most of the impacts of the program and the projects funded have yet to occur and no productivity gains have yet occurred. By 1991/92 added sales revenues are expected to reach between $12-$24 million and marketing expenditures between $2-$4 million annually. Similarly, employment levels will increase as product sales grow. By 1991/92 between 108 and 216 person years of direct project employment and an additional 137 to 225 person years of induced or indirect employment will be created annually.

Economic and financial indicators have improved only slightly to date because of the program - except for private investment which has been boosted considerably. However, projections of revenues and employment and exports by 1991/92

show they should grow several percentage points because of the program and if this occurs, private investment in other firms could be improved as successful projects demonstrate the returns possible. Infrastructure improvements will likewise begin to extend beyond program beneficiaries only as their projects begin to reach sales targets and other firms in the industry are benefited by the growth in the sector's sales and employment.

Exhibit 5.24 summarizes the incremental program impacts to date (total to 1987/88) and the forecasted annual incremental impacts by 1991/92.

Overall program effectiveness has been good. There is general agreement that help is needed to attract financing for new product or service development and the method chosen by the program - lowering risk by contributions - is widely accepted as an effective mechanism. Many respondents praised staff and program managers for their efforts and assistance.

However any program can be improved and many suggestions given related to program delivery and the selection process:

- need a relatively quick, clear cut delivery system;
- publicity needed early on in the program
- avoid funding ordinary operating expenses of new start up firms;
- encourage repayment or more highly leveraged contributions for projects in later stages of development;
- allow changes in project focus
- fund market planning at each stage of technical development in projects; and
- increase support to projects with private sector partners.

EXHIBIT 5.24: SUMMARY INCREMENTAL IMPACTS

	Total To Date	By 1991/92 Annually
Employment - Direct	64 person years	108-216 person years
- Indirect & Induced	3 person years	137-275 person years
Total	67 person years	245-491 person years
in Manitoba - Direct	59 person years	99-198 person years
- Indirect & Induced	1 person years	55-110 person years
Total	60 person years	154-308 person years
Productivity	--	+0.4-0.9%
Private Investment	$1.4 million	$1.3 - $2.7 million
Marketing Expenditures	$260 thousand	$2.0 - $2.7 million
Sales Revenue	$230 thousand	$12- $24 million
Exports	$80 thousand	$7.1 - $14.3 million (but uncertain)
Gross Domestic Product		
- Direct	$156.2 thousand	$8.2-$16.3 million
- Indirect & Induced	$80.5 thousand	$5.2-$10.3 million
Total	$236.7 thousand	$13.3-26.6 million
in Manitoba		
- Direct	$142.9 thousand	$7.5-14.9 million
- Indirect & Induced	$39.3 thousand	$2.3-$4.5 million
Total	$182.1 thousand	$9.8-$19.4 million
Diversification	several new firms and activity in several new fields	unknown
Managerial Skills	some improvement	some improvement in some firms
Profitability	--	unknown but likely to increase
Manitoba Content	--	unknown
Distribution of Benefits	allocated proportionately to all eligible fields and all firms sizes but not proportionately to all social groups.	

EXHIBIT 5.24: SUMMARY IMPACTS (cont'd)

	Total To Date	By 1991/92 Annually
Program Delivery	slow and uncertain application process for half of respondents	
Awareness of Program	low awareness in first 2 years but muc higher since Brandon Workshop. Still low awareness of projects funded.	

FOOTNOTES -- CHAPTER 5

1 John Puddington, President of the Association of Canadian Venture Capital Companies reported that in Canada, there has been a decline in the proportion of private venture capital in high technology fields (from 53% in 1986 to 37% in 1987) because of better returns in leveraged buyouts or company expansion. New start up companies average ROI is 16% in 4 years while leveraged buyouts average ROI is 53% in 2.1 years - Vacouver Sun, May 18, 1988.

2 InfoTech, Profile of the Manitoba Software Industry, November, 1987.

3 Tarry & Associates, Background Paper: Opportunities for Manitoba's Telecommunications and Informatics Industry, January 1987.

6.0 BREAK EVEN BENEFIT/COST ANALYSIS

Economic impact analysis (presented in the last section) is a legitimate technique for evaluating the economic consequences and potential economic benefits of federal-provincial economic development agreements and other government program initiatives. At the same time, impact analysis has a number of limitations:

- It takes no account of the social opportunity cost of the factors of production. Economic **impacts** therefore cannot be treated as economic **benefits** (although they are often mistakenly taken as the same) especially in economies where unemployment is low and productive resources are heavily utilized;
- Impacts based on an input-output model (as those in Section 5 are) largely look backwards to identify supplier related effects of funded projects. It does not assess forward linkages, new technological efficiencies, cost savings and productivity improvements resulting from the projects funded; and
- Economic impact analysis is based on input-output model multipliers are static, and do not address the dynamic changes which are at the heart of the Agreement.

Economic impacts improperly treats impacts as benefits and ignores other effects which would result in improvements to economic efficiency and welfare. We have therefore supplemented our impact analysis by a rough order of magnitude benefit-cost appraisal, employing (to the extent possible) the principals of benefit cost analysis of the Treasury Board's Benefit-Cost Guidelines. Nevertheless, this analysis is not a full benefit-cost analysis and cannot be treated as such. The limits of this section's analysis are explained below.

Costs to society, including private and government costs, are

relatively easy to identify and quantify. They include total project investment from all sources - adjusted to account for opportunity costs. However benefits are more uncertain. These arise from gross operating profits and exports of new and expanded businesses provided with contributions and feasibility studies, the improved productivity of their customers, and indirect effects on the profits or exports of enterprises not receiving funds but benefiting from any improved investment climate or spin off technical developments resulting from the Agreement. Even broad order of magnitude estimates, as attempted here, are uncertain because benefits will occur far in the future and depend on many external factors such as market and technological development.

Where costs are known but benefits are uncertain, a form of benefit-cost analysis which can be called break-even benefit-cost analysis can be employed. This essentially asks: Is it likely that the future stream of economic benefits to be generated by funded projects and others will exceed, in present value, the cost to society of the program?

The first step is to adjust total project investment costs of projects for the utilization of underemployed labour and other factors of production. The projects funded by the component invested and expect to invest $17.3 to $24.9 million between 1984/85 and 1991/92 (see Section 5). Adjusting for inflation, assuming that wages and salaries account for 37.3% of this investment and assuming the opportunity cost of this portion of the investment is 90%, we estimate that the costs to society of this investment is about $16.7 to $24.1 million in 1988 dollars. At a 10% discount rate[1], over the next 20 years these costs equal about $11-$15 million in present value terms.

The next step is to estimate the benefits from this investment. Benefits come from several source:

- increased operating profits and labour income from sales of the firms receiving program funds are the easiest to identify. Capital surplus and labour income have been estimated by beneficiaries to equal about 67.4% of project sales. Not all of this represents social benefits. Costs of depreciation, interest charges and the labour income of workers who would have been employed without the projects are included in the 67.4% estimate and need to be excluded from benefits. Perhaps only 14% of sales should conservatively be considered as added social benefits (say 10% operating profit and 4% incremental labour income[2];

- increased operating profits and labour income from productivity gains in firms purchasing the products and services sold by beneficiaries are more difficult to identify. An unknown portion of the market price of sales represents the benefit to the customer of the purchase. Most beneficiaries expect their customers to increase their efficiency by purchasing their products or services but most were unable to quantify these gains.

  Customer's productivity gains will also require them to incur added costs adopting the new technologies, which must be subtracted from benefits. Because neither productivity gains nor implementation costs are known, we have not attempted to include customer benefits in this assessment.

- benefits resulting from the indirect technological developments, improved investment climate or spinoffs which, although not directly funded by the program, could be partly attributed to the program's and its projects' activities. These are the least certain benefits. Although many respondents expected these to occur, for this analysis no estimate has been made of the value of these benefits.

Based on interviews with beneficiaries, businesses expect to generate an incremental sales revenue stream of from $12-$24 million a year by 1991/92 (this includes only 20 - 40% of the projections given by beneficiaries to account for potential business failures.). A portion of these sales provide economic benefits. 14% of incremental sales revenue from Exhibit 5.9 was assumed to approximate social benefits ($1.6-$3.4 million a year by 1991/92).

The assumed benefits were also discounted at 10% over the next 20 years (assuming benefits stay at $1.6-$3.4 million a year from 1991/92 to 2007/2008), and this benefit stream was found to equal about $9-$17 million in present value terms, either exceeding costs by $2 or falling below costs by $2 million. The results therefore imply that if 14% of ERDA supported project's sales are a close approximation of social benefits from beneficiaries increased operating profits and labour income, then these social benefits will roughly match its social costs.

However, applying a different discount rate can easily affect the results. At an 8% discount rate benefits are more likely to exceed costs; at a 12% rate benefits are less likely to exceed costs:

Net Present Value		costs	benefits
	8%	$12-$17m	$11-$21m
	10%	$11-$15m	$9-$17m
	12%	$10-$14m	$7-$14m

As sales forecasts are uncertain, a test of this assumption was also performed. If sales fail to reach $12-$24 million until 1992/93 the gap between benefits and costs narrow by 15%. Only a few years of delayed sales could easily wipe out the positive contribution of the program. For this reason, and because the program has not yet completed its funding, it is important for program managers to closely follow up the projects funded to ensure they are able to meet their forecasts and to continue to assist them in generating economic benefits.

In summary, we cannot definitively conclude that benefits first will exceed costs (because of the uncertainty of benefits and because we are only able to make order of magnitude estimates of benefits) but benefits are likely to exceed costs. We estimated only one of three potential benefits and those estimates have accounted for the potential for business failure, yet benefits still roughly equal the costs of the program, assuming a 10% discount rate. If other benefits could be estimated, we expect program benefits would likely exceed costs.

FOOTNOTES

1 As suggested by the Treasury Boards's Benefit-Cost Guidelines. This social discount rate differs from the interest rate a private investor may use in that it reflects the present generation's weighing of benefits and costs to be borne by future generations.

2 This accounts for the opportunity cost of labour (assumed to be 90%) and only considers 10% of labour costs (all labour costs equal 37.3% of sales) as a benefit. 10% operating profit is a conservative estimate. Most beneficiaries expect their profits to be above industry averages (they expect gross profits of between 12 and 50% of gross sales.)

7.0 CONCLUSIONS AND RECOMMENDATIONS

The Technology Applications Steering Committee are already aware of many of the conclusions and recommendations arising from this evaluation. In fact they provided many of these ideas and, through their own process of Mid-Term review and on-going evaluation of projects, are already implementing some. The recommendations are therefore more often confirmations of the program's current focus and direction. Where a change should be considered for any future programs, this is noted in the text.

7.1 Conclusions

7.1.1 Objectives Achievement

The program has to date, only partly achieved its objectives however, future project success promises to achieve them.

In total, by 1987/88 the program has:

- helped 6 new start up firms establish;
- created about 67 person years of employment (64 direct and 3 induced or indirect), 60 of which are in Manitoba (59 direct and 1 indirect or induced);
- stimulated about $1.4 million in private investment, $260 thousand in marketing expenditures, and $230 thousand in sales revenue (of which perhaps $80 thousand has been from exports);
- had no measurable effect on productivity; and
- improved industry infrastructure for beneficiary firms.

By 1991/92 the program is forecast to:

- create between 245 and 491 person years of employment annually (108-216 direct and 237-275 indirect or induced) of which 154-308 person years will be in Manitoba (99-198 direct and 55-110 indirect or induced);
- stimulate $1.3-$2.7 million a year in private investment, $2.0-$2.7 million in marketing expenditures, and $12-$24 million in sales (of which $7.1-$14.3 million will be from exports but this is more uncertain);
- increase industry productivity by 0.4% - 0.9%;
- and improve industry infrastructure through a demonstration effect on new private investment and through increased purchases of goods and services from other firms in the industries.

7.1.2 Impacts and Effects

As noted above, economic and financial indicators in the industries have improved only slightly to date because of the program - except for private investment which has grown considerably - but, as projects are completed by 1991/92, revenues, productivity, employment, private investment and marketing expenditures will all increase. Other measures are slightly more mixed.

The sector's revenues, already growing before the program, have so far been only slightly increased by the program but are expected to grow by about 1.5%-3.0% because of the program by 1991/92.

Productivity in the sector will increase by between 0.4% and 0.9% from 1984 to 1991/92 as a result of the program and beneficiaries productivity is expected to grow by 40%.

Employment growth, while not large, is expected to increase the sector's total Manitoba employment 1-2% by 1991/92, not including indirect or induced employment impacts. As well, the jobs created assist in keeping skilled graduates in the province and increase the skills of the industry, investing in the human resources of Manitoba.

Private investment in research and development, never very high in Manitoba's sector, has grown dramatically because of the program - a total incremental increase to date of about 7% on all business expenditure in natural science and engineering research in Manitoba in 1985, and growing by between 4% -13% of 1984 levels by 1991/92.

Marketing expenditures are also expected to grow although most of the additional spending will be from new start up companies therefore the program has probably not affected the marketing of existing firms greatly.

The program has established new businesses in unique fields and has assisted existing firms expand into new fields. Therefore diversification has been promoted. But diversity is not seen as a strength of the Manitoba sector. The sector lacks depth and the program has also sponsored several projects in some areas such as health care and electronic publishing and expert systems to add depth to the sector.

Managerial skills have been improved for some beneficiaries but not all, and the program has not attempted to duplicate services in this area, so cannot be credited with any major improvements.

Exports have increased slightly and are forecast to dramatically rise by 1991/92 however most of the increase is from start up firms so future exports are uncertain.

Although profitability has not yet been affected, the financial situation of beneficiaries has improved because of their ERDA contribution and their ability to attract private investment has improved. Most beneficiaries and many nils feel the program has also improved the general investment climate in their industry.

Some in the industry purchase little or nothing from Manitoba suppliers and others purchase almost everything in Manitoba (including investment). Few beneficiaries expect their pattern of inputs to change because of the program therefore there is little evidence that the amount of Manitoba content will be affected by the program, except by the increase caused by growing purchases of goods and services to produce products for sales.

Benefits of the program have been distributed evenly among various eligible fields and firm sizes, as was the intention of the Steering Committee; however the program made no attempt to set social or ethnic group or female participation criteria and so has not distributed funds proportionately among various social groups or between males and females. Historically, natural science and engineering research and development has had few women (although this is now changing) but the program has not addressed this issue.

About half of those interviewed in the industry were dissatisfied with the speed of program delivery. The process averaged 30 weeks from initial contact to receiving funds. Because of the importance of time in rapidly changing technologies, some delay in the program's economic impacts have probably occurred.

Most in the industry are aware of the program's existence because of the publicity surrounding the Mid-Term Review

Workshop and the efforts made to stimulate proposals for the program. However, few know about specific projects receiving funds or about the role of each government. Because the province has not administered the projects, announced approvals or contributed funds to the component, few in the industry are aware of their contribution. The program is identified largely as a federal program.

7.1.3 Industry Problems and Opportunities

Lack of capital and lack of marketing (both marketing expertise and a distribution infrastructure) are still the major problems faced by the industry. In all high technology fields, a gap continues to exist between the research and commercialization of new products and services.

Market planning is a prerequisite for obtaining financing needed to bridge the gap and many firms in the sector are not able to afford, or lack the expertise to do adequate market planning.

Small start up firms, in addition to financing problems, need a range of incubator services. Large firms with financial backing often lack a product development mandate. Bringing these groups together remains one of the province's greatest areas of opportunity.

The sector has developed since the programs inception but a critical mass has not been achieved yet for sustained growth. The knowledge base of the sector is its greatest resource and it is as important to maintain and increase the human capital in the industries as the physical or financial capital. Increased technical and managerial skills, as well as commercial applications of innovative technology are needed constantly to keep the sector viable.

7.1.4 Program Effectiveness

The Agreement's formula is clearly the most effective mechanism to achieve the expected objectives and impacts.

Most people who felt the program was not the most effective mechanism (35% overall) were not concerned with the basic formula so much as with the program's delivery. More resources locally and earlier publicity to encourage proposals would eliminate most of this dissatisfaction.

There is general agreement that lowering the risk of new investment through contributions is necessary and effective in stimulating investment. Many respondents also praised staff and program managers for their efforts and assistance.

7.2 Recommendations

7.2.1 Program Objectives

Future program should try to achieve the following objectives:

1. commercial development of the communications, computing services and electronics industries.
   - increased sales, exports, private investment, etc. are essential and should be a mandatory criteria of projects - i.e. projects must be able to make a business case;
2. human capital development
   - increased technical skills, and management skills
   - increased application of new, innovative technology (market application not just research application); and
3. increase efficiency of the industries and firms

Job creation or maintenance are not satisfactory objectives for future programs as it is the quality of jobs (sales generated, wages paid, technical skills used, etc.) that ensure their existence, not government funding. Increased efficiency will do more to generate future jobs than job creation. Also, existing job creation programs can often give start up firms the initial human resources to get established but future programs should upgrade and train to avoid obsolescence of jobs. The focus of new program funding should be on improving the knowledge and human capital base of the Manitoba industry.

Increase support to projects with private sector partners.

Although specific application area opportunities could be targeted, targets could also be set by proponents through requiring all applicants to make joint venture applications for funding (for example customer co-development agreements where the firm with a new product idea works with a customer to develop the product. In return for the customer's assistance, they receive a royalty on future sales to other customers). This kind of joint venturing would ensure proper marketability assessments, lower the risks for other private investors, improve the viability of projects and would automatically target the assistance in fields with the most commercial potential.

Avoid funding ordinary operating expenses of new start up firms.

Small start up firms require more than funding: they need expertise, advice, cheap space and services and hard work to survive. Future programs should not ignore these needs but

should not duplicate existing services in these areas. Incubator services should not be the focus of future programs. Instead the focus should be on the commercial application of new products or services. Project funding should not be the sole source of operating income for firms. Nevertheless start up firms should still be eligible for funding in future programs as they often have the most innovative ideas.

Fund market planning at each stage of technical development.

Although some ERDA approved projects included market studies, these should be more emphasized in future programs. Credible market studies are essential to attract the financing required to commercialize new products. By contributing to the costs of commercialization, future programs should continue to lower risk of new investment for firms. This, in itself, is important but if the investment is going to be self sustaining it must have a demonstrated marketing and distribution plan. Future programs should fund ongoing market and distribution planning together with the technical development of products, not after products are complete.

Allow changes in project focus.

Future programs must also be flexible in ongoing project monitoring. Some method of stopping part way through projects is needed (if market planning discovers new opportunities or reveals the original opportunity no longer exists) without defaulting on the contribution agreement.

Encourage repayment or more highly leveraged contributions for projects in later stages of development.

Because applicants are in various stages of product (and business) development, one set of criteria does not apply equally to all circumstances. Separate criteria could be developed for:

- getting product to prototype stage (these are largely technical planning projects)
- getting prototype to commercialization stage (these involve testing and pre-production design); and
- getting marketing, packaging, manufacturing and distribution arranged.

Funding of the first stage projects may not need as much matching private contribution. The second and third phases should be far enough developed to be able to attract more private investment so could be more highly leveraged.

To enable future programs to maximize their effect, later phases could be negotiated with royalty or payback provisions tied to sales of the product. The program could then benefit from successful projects, providing an incentive for prudent investment. At the same time firms whose sales were not as high as they hoped would not be penalized as they would under a loan program by having to meet their repayment schedule without the income to do so.

The optimum amount of future program funding should not be lower than the $5.9 million authorized under ERDA (this program received applications for more projects than they were able to fund so less money would mean even more firms rejected) but it is not possible to say how much more would be needed. This will depend on the ability of the industry

to capture increased private investment.

7.2.2 Program Delivery

A quick, clear cut delivery system is needed.

The process could be speeded up by more frequent Steering Committee meetings and more locally based administrative staff. More local staff are needed both for selecting projects and for monitoring ongoing programs. The present program is not yet over and monitoring ongoing projects will also require sufficient staff with the ability (administrative and technical) and authority to oversee changes in projects. Without this follow up and monitoring, the likelihood of project success will decrease and the program's economic effects could be lowered.

The process of application needs to be neither more nor less formalized. However, future program should clearly explain the process to applicants. Firms will be better able to judge for themselves if the program can help them if they know in advance what will be expected of them. The need for negotiations and the likely time for decision making should be explained in program literature.

Firms needs a clear cut process that is fast. Application processing time is important in high technology fields where windows of opportunity only exist for weeks or months.

It will always be necessary to restrict funding to project activities (as opposed to normal operating expenses). Future programs should not simply fund any new products: the products need to be innovative. But innovation is relative: what is innovative for some firms may be old hat to others therefore criteria need to continue to be flexible because of

the variety of firms and fields and the rapidly changing nature of the industries.

Publicity is needed early in the program to stimulate proposals.

The Steering Committee found the Brandon Workshop involved the industry in setting objectives and made the industry aware of the program. Awareness was further increased through the proposal stimulation project. This kind of publicity should be the starting point for future programs.

7.3 Summary

Over the course of the next few years the objectives of the program will be attained. Revenues, productivity, employment, private investment and marketing are all expected to increase in the next few years in response to the increase in private investment stimulated by the program.

Marketing and financing remain the major problems of the industry and the program is widely regarded as an effective mechanism for helping the industry. It remains necessary to help lower the risks of investment in the industry through contributions and the program's formula has worked.

Future programs should consider the following recommendations:

1. A quick, clear cut delivery system is needed.
2. Publicity is needed early in the program to stimulate proposals;
3. Avoid funding ordinary operating expenses of new start up firms;
4. Encourage repayment or more highly leveraged contributions for projects in later stages of

development;

5. Allow changes in project focus;

6. Fund market planning at each stage of technical development in projects; and

7. Increase support to projects with private sector partners.

APPENDIX A

TERMS OF REFERENCE EVALUATION QUESTIONS

ANNEX: TABLE OF INDICATORS

EVALUATION QUESTIONS	INDICATORS	EVALUATION CRITERIA	DATA SOURCES	STUDIES
A. RATIONALE:				
1. Does the Agreement allow a better coordination of the policies and programs of both governments in the cultural and communications/information technologies industries?	Opinion of Agreement managers and policymakers within both governments.	Positive opinion.	Interview with Agreement managers and other government people working in relation to subsidiary-agreements.	Study #1.
2. Is the Agreement improving access to government programs for the industrial sectors concerned?	Opinion of Agreement managers and industry associations.	Positive opinion.	Interview with industry representatives and with Agreement managers.	Study #1.
3. Is the Agreement still needed for the development of both industry sectors?	Same as above.	Positive opinion and suggested modifications to the programs.	Same as above.	Same as above.
4. Are the Agreement objectives still consistent with the actual priorities and policies of both governments?	Opinion of upper management in both departments and review of pertinent policy documents.	Possible differences due to budget constraints, new priorities and industry evolution.	Same as above.	Same as above.
B. OBJECTIVES ACHIEVEMENTS:				
5. Do the projects approved under the Agreement correspond to the ERDA and Sub-Agreement objectives?	Project description and Agreement Objectives	Consistency between Projects and objectives.	Secretariat's files.	Same as above.

EVALUATION QUESTIONS	INDICATORS	EVALUATION CRITERIA	DATA SOURCES	STUDIES
6. Are the programs contributing to regional economic development of the province?	Regional allocation of the program contribution and regional distribution of the various industry segments.	Balanced allocation.	Industry statistics (Stat. Can. and industry associations) and Secretariat's files.	Same as above.
7. Are the programs contributing to the creation of opportunities for the people of Manitoba?	Creation of jobs and of new enterprises.	Positive response.	Interview and survey of beneficiaries.	Study #1, 2, 3 and 4.
8. Are the programs contributing to the improvement of the infrastructure of the communication and cultural industries?	More efficient enterprises providing services to the communication and cultural industries.	Positive contribution.	Secretariat's files, interview and survey of beneficiaries.	Same as above.
9. Are the programs contributing to the improvement of the productivity at the industry level and for the beneficiaries?	Incremental level of productivity of the industry and incremental level of productivity of the beneficiaries.	Improvement due to the program contributions.	Statistics Canada, interview and survey of beneficiaries.	Study #2, 3 and 4.
10. Are the programs contributing to the stimulation of private investment in both sectors?	Incremental private investment due to program contributions.	Significant proportion.	Secretariat's files, interview and survey of beneficiaries.	Same as above.
11. Are the programs contributing to the improve the marketing of beneficiaries' products or services?	Marketing and promotion budgets and effective sales of beneficiaries.	Increased in expenditures and sales.	Same as above.	Same as above.
C. IMPACT AND EFFECTS				
12. What is the actual situation of three sectors with regard to the main economic and financial indicators?	Industrial typology. Main economic and financial indicators before and after the Agreement.	Trends.	Statistics Canada, industry associations and other documents.	Same as above.
13. What are the major economic and industrial problems in the three sectors?	Identification of the problems affecting the growth of both industries.	Lack of access to capital, lack of access to various markets, short supply of skilled labour, etc.	Interview with programs beneficiaries and industry representatives.	Same as above.

EVALUATION QUESTIONS	INDICATORS	EVALUATION CRITERIA	DATA SOURCES	STUDIES
14. What are the incremental effects of the programs on output, productivity, employment private investment and marketing activities?	Increased output, productivity, etc.	Positive.	Same as above.	Same as above.
15. Are the programs promoting the diversification of activities in all three industries?	Increased average number of products for individual beneficiaries.	Effective increases.	Same as above.	Same as above.
16. Are the programs contributing to the improvement of the management skills of beneficiaries?	Opinion of beneficiaries.	Positive.	Same as above.	Same as above.
17. Are the programs contributing to the improvement of the export activities?	Increased marketing and promotion activities in foreign markets and increased export sales.	Effective increases.	Same as above.	Same as above.
18. Are the programs contributing to the improvement of the financial situation of beneficiaries?	Improved access to capital and profitability.	Positive.	Same as above.	Same as above.
19. Are the programs contributing to an increase in Manitoba's content in the output of beneficiaries or output of their clients?	Level of output of the beneficiaries and average purchases by client.	Increased content.	Same as above.	Same as above.
20. Are the programs' contributions benefiting all social groups?	Allocation of contributions among the various social groups.	Proportional distribution.	Same as above.	Same as above.
21. Are the programs contributing to the cultural enhancement of the population and more visibility for Manitoba's cultural products?	Cultural products sales before and after the Agreement in Manitoba and outside the Province.	Positive.	Same as above.	Same as above.
22. Is the programs' management providing fast delivery of the programs?	Time to process applications as compared to other government programs.	Positive.	Same as above.	Same as above.
23. Is the public aware of both governments' contributions into the various projects?	Opinion of beneficiaries and methods used to announce it.	Positive answers and examples of announcements.	Same as above.	Same as above.

EVALUATION QUESTIONS	INDICATORS	EVALUATION CRITERIA	DATA SOURCES	STUDIES
D. ALTERNATIVES:				
24. Is the Agreement formula the most effective mechanism to achieve the expected objectives and impact?	Opinion of beneficiaries, industrial representatives and Agreement managers.	Positive.	Interview with beneficiaries, industrial representatives and Agreement managers.	Study #1, 2, 3 and 4.
25. Are there any other government programs that duplicate the Agreement program?	Opinion of other government programs managers.	Negative and description if positive.	Interview with other government program managers.	Study #1.
26. Could the program be improved in order to meet the needs of both sectors?	Opinion of beneficiaries and industrial representatives.	Suggestions for changes.	Interview with beneficiaries and industrial representatives.	Study #2, 3 and 4.

APPENDIX B
INTERVIEW GUIDES

PA# _____ Project File # _____ Interview # _____

ERDA TECHNOLOGY APPLICATIONS COMPONENT
ECONOMIC IMPACT INTERVIEW GUIDE
(Beneficiaries)

Basic Data

. Date: day _____ month _____
. Name: _____ 3. Position: _____
. Organization: _____
. Address: _____
_____
. Telephone: (____)_____

Organization & Project

a. How many employees do you have? _____ full-time _____ part-time
b. What year did the firm begin operations?_____ in Manitoba?_____
. What industry are you in? _____
. What fields(s) do you specialize in? _____
_____
_____

). What other firms in Manitoba operate in the same field(s)? _____
_____
_____

1a. What are your firm's main products or services, in order of sales revenue?

1 _____ 4 _____
2 _____ 5 _____
3 _____ 6 _____

1b. What are your present gross revenues/year? _____
2. Which of these did you sell before 1985?

_____ _____ _____ _____ _____

3. What are your main areas of research/development for the future?

1 _____ 3 _____
2 _____ 4 _____

4a. What was/is the topic of your ERDA project? _____
_____
_____
_____
_____

4b. What stage are you now at in your project?

_____ technical research
_____ start-up of commercial development
_____ feasibility/market studies and plans
_____ testing/prototype/investment
_____ promotion and marketing
_____ initial sales
_____ production and sales

Project Impacts

5. ERDA contribution authorized?

	85/86	86/87	87/88	88/89	89/90
$K	_____	_____	_____	_____	_____

6a. How many <u>full time</u> jobs were/will be created <u>directly</u> by the project, <u>in addition</u> to your firm's previous employment?

	85/86	86/87	87/88	88/89	89/90	90/91	91/92
management	_____	_____	_____	_____	_____	_____	_____
clerical/ production	_____	_____	_____	_____	_____	_____	_____
sales	_____	_____	_____	_____	_____	_____	_____
professional/ technical	_____	_____	_____	_____	_____	_____	_____
other	_____	_____	_____	_____	_____	_____	_____
TOTAL	_____	_____	_____	_____	_____	_____	_____

6b. What proportion of those hired to date are female? _____%

7. For 1988/89 to 1991/92, what is the probability that the projected jobs will be created? _____%

8. What proportion of the jobs will be/are in Manitoba?

management _____%
clerical/production _____%
sales _____%
professional/technical _____%
other _____%
TOTAL _____%

Ba. How many <u>part time</u> jobs were/will be created <u>directly</u> by the project, in addition to your firm's previous employment?

	85/86	86/87	87/88	88/89	89/90	90/91	91/92
anagement							
lerical/ roduction							
ales							
rofessional/ echnical							
ther							
TAL							

b. What proportion of those hired to date are female? _____%

. For 1988/89 to 1991/92, what is the probability that the projected jobs will be created? _____%

1. What proportion of the jobs will be/are in Manitoba?

management _____%
clerical/production _____%
sales _____%
professional/technical _____%
other _____%
TOTAL _____%

2 a. Has/will <u>the project</u> create improvements to:

	Yes	No	Don't Know
your firm's efficiency			
your customer's efficiency			
the future growth of your industry			
the future growth of other industries			

If yes for any, what improvements?

_____

_____

_____

_____

_____

_____

b. What are/will be the economic benefits <u>to users</u> of your project's product/service?
(Mark in order of importance, 1 most important, 2 second most important, etc.)

_____ cost savings
_____ increased sales revenue with no change in user's product or service
_____ increased sales revenue as a result of improved user's product or service
_____ increased sales revenue as a result of new user products or service

c. If cost savings, what user cost items are/will be affected by your project?

_____
_____
_____

d. How much has/will costs be reduced (% of total costs, % of user products selling price or $ per unit sold)? _____
_____
_____

e. If increased revenues, what has/will cause user revenues to increase?

_____
_____
_____

f. How much has/will revenues increase (% of total revenues, % of user products selling price, $ per unit sold)? _____
_____
_____

22g. What industries are/will your customers (be) in? _____
_____
_____

h. What is/will be the value of the average purchase of your product/service per customer?

$_____ before project $_____ after project

3. Has/will the project increase your firm's productivity

_____Yes _____No _____Don't Know

If yes, by how much _____% (of what _____)

and how? _____

_____

_____

_____

4. Has/will the project increase the production of other industries?

_____ yes _____ no _____ don't know

If yes by how much _____% (of what _____)

which industries and how?_____

_____

_____

_____

_____

5. In addition to ERDA contributions, how much private investment has/will your firm or other private sources contribute to your project, in addition to your normal annual investment?

efore roject	85/86	86/87	87/88	88/89	89/90	90/91	91/92
_____	_____	_____	_____	_____	_____	_____	_____

5 a. For 1988/89 to 1991/92, what is the probability that the projected private investment will be made _____%

b. Has the program had any effect on the general investment climate in your industry?

What effect? _____positive _____neutral _____negative

Elaboration _____

_____

_____

_____

_____

_____

7. In addition to ERDA contributions, how much other government funding has/will your project receive?

efore roject	85/86	86/87	87/88	88/89	89/90	90/91	91/92
K	_____	_____	_____	_____	_____	_____	_____

28. For 1988/89 to 1991/92, what is the probability that the projected government funding will be received? _____%

To get a better idea of the economic impacts of the program and the projects it funds, we need to find out about the financial aspects of projects. None of the information on individual firms will be reported -- only aggregate figures from the sum of all projects.

29. What was/will be the annual gross sales from products or services directly resulting from the project?

85/86	86/87	87/88	88/89	89/90	90/91	91/92
_____	_____	_____	_____	_____	_____	_____

0. What percent will be from sales outside Canada?

_____%	_____%	_____%	_____%	_____%	_____%	_____%

1. What percent will be from sales in Manitoba?

_____%	_____%	_____%	_____%	_____%	_____%	_____%

32. For 1988/89 to 1991/92, what is the probability that the projected sales will be reached? _____%

33. What is/was the value of your firm's sales of products and services not related to the project -- those in addition to Question 29.

$K _____ Year _____

34. Do you expect the value of these non-project sales to increase or decrease? _____% a year

35a. Could we get a copy of your firm's most recent project income statement and projected income/expenditures?

35b. What has been/will be the project's total expenditures?

Before ERDA	85/86	86/87	87/88	88/89	89/90	90/91	91/92
_____	_____	_____	_____	_____	_____	_____	_____

35c. What has been/will be your project's salaries, wages and benefits costs?

	Before ERDA	85/86	86/87	87/88	88/89	89/90	90/91	91/92
$	_____	_____	_____	_____	_____	_____	_____	_____

35d. For your project's expenditures what types of materials, services or equipment were/will be purchased from other companies or contracted out and what proportion of the total spending was/will be for each type?

Type of Material, Service or Equipment	%
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Total purchased from Others	_____ % of 35b

35e. What has been/will be the project's marketing and promotion costs?

	Before ERDA	85/86	86/87	87/88	88/89	89/90	90/91	91/92
$	_____	_____	_____	_____	_____	_____	_____	_____

36. What is/will be your firm's project profit/loss?

Gross Profit	_____	_____	_____	_____	_____	_____	_____
Net Profit	_____	_____	_____	_____	_____	_____	_____

(before taxes and capital charges)

37. Of the marketing and promotion costs mentioned, what percent has/will be spent in foreign markets?

_____% Before Project _____% During Project _____% After Project

38. Before your project, what proportion of your products/services inputs were produced in Manitoba?

_____% materials and equipment

_____% labour

_____% investment

41. After the project, what proportion do you expect to be produced in Manitoba?

_____% materials and equipment inputs

_____% labour inputs

_____% investment

40. Has the project helped develop spin-off industries or joint ventures?

_____Yes _____No _____Don't know

If yes, what spin offs or joint ventures?

_____

_____

_____

_____

_____

General Effect of Sub-Agreement Technology Application Component

42. What are the main problems affecting your industry?
(access to capital, small market, specialized labour, management skills, marketing infrastructure, technology, profitability)

_____

_____

_____

_____

_____

_____

_____

42a. How has your firm attempted to overcome these problems? _____

_____

_____

_____

_____

_____

2b. Has/will the Technology Application Program/staff/funding assisted you in overcoming these problems? _____Yes _____No _____don't know

Elaborate _____

3. Has/will the program improve the technical or management skills of your firm? ____Yes _____No _____don't know

If yes, how? _____

_____If no, why not? _____

4. Has/will the program improve your firm's ability to attract private investment? _____yes _____no _____don't know

If yes, how and from what sources? _____

If no, why not?_____

5. Has/will the program improve your industry's diversification?

_____Yes _____No _____don't know

If yes, how?_____

If no, why not?_____

_____

_____

_____

5. Have the program funds been distributed proportionately among all types of eligible fields?

_____yes _____no _____don't know

If no, why not? _____

_____

7a. Has funding been allocated proportionately among large and small firms?

_____yes _____no _____don't know

If no, why not?_____

_____

_____

_____

7b. Has funding been allocated proportionately among all ethnic and social groups? (women, Natives, francophones)

____ yes ____ no ____ don't know

If no, why not? _____

_____

_____

_____

8. How many weeks did it take between your first contact with program staff and your initial request for funding? _____weeks

9. Between your initial request and your full proposal? _____weeks

0. Between your full proposal and the project authorization?___weeks

51. Between the authorization and the contribution agreement?___weeks

2. Between the agreement and your first receiving funds? _____weeks

53. Are you satisfied with the speed of this process?

_____ yes _____no _____don't know

If no, what part of the process was delayed and why?

_____48. _____

_____49. _____

_____50. _____

_____51. _____

_____52. _____

_____other _____

4. Is your industry aware of both the federal and provincial contributions to the Sub-Agreement?

_____yes _____no ____don't know

If no, why not? _____

5. What public relations or communcation activities has your project engaged in?

5b. Did they specifically mention the ERDA funding you received?

_____ yes _____ no _____ don't know

6. The ERDA objectives are to complement Manitoba's economic development strategy, increase employment and income opportunities, maximize social and economic benefits, foster cultural products, strengthen human managerial, creative, financial, technological and structural resources, and stimulate private sector investment. Is the present program the most effective mechanism to achieve the expected objectives and impacts?

_____yes _____no _____don't know

If no, why not? (program funding appropriate?) _____

If no, what should be changed and how? _____

7. How could future programs be improved to better meet the needs of industry?

58. For your project, how much would have been carried out by you during the same period if your project had not been funded? _____

1 None If None, go to Q. #59
2 minimal amount If 2,3,4, or 5
3 moderate amount would you have:
4 most
5 all

_____ used other funds you had at the time
_____ other federal government funds
_____ provincial government funds
_____ funds from private sources
_____ your own organization's funds
_____ other (specify) _____

_____ obtained additional funds from other sources
_____ other federal government funds
_____ provincial government funds
_____ funds from private sources
_____ your own organizations funds
_____ other (explain) _____

59. If your project funding had not been available, what changes would you have made to the project outlined in your proposal.

_____ no significant change - funds available from other source
_____ delayed project by _____ years
_____ scaled down project to _____% of originally proposed
_____ other (explain) _____

_____

_____

60. Are you aware of similar projects being carried out independently on the same topic? _____yes _____no _____don't know
If yes, was this parallel project being carried out in Canada?
_____yes _____no

61. Would/will the same project results have been/be generated (by your firm or another) if the program had not existed?
_____yes _____no _____don't know
If yes, would/will the results occur at the same time
_____yes _____no _____don't know
If no, the results would occur _____years later

2. Do you have any other comments or information on the economic impacts of the program or your project? _____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR HELP

Project File # _____ Interview #

ERDA TECHNOLOGY APPLICATIONS COMPONENT

ECONOMIC IMPACT INTERVIEW GUIDE

(Nils)

Status

_____ reject ____going ahead
_____ withdrawn ____cancelled/on hold
_____ in process ----->go to beneficiaries guide
_____ other _____

Basic Data

Date: day _____ month _____

2. Name: _____ 3. Position: _____

Organization: _____

5. Address: _____

_____

6. Telephone: (___)_____

Organization & Project

7a. How many employees do you have? _____ full-time _____ part-time

What year did the firm begin operations?_____ in Manitoba?_____

8. What industry are you in? _____

What fields(s) do you specialize in? _____

_____

_____

9. What other firms in Manitoba operate in the same field(s)? _____

_____

_____

10a. What are your firm's main products or services, in order of sales revenue?

1 _____ 4 _____

2 _____ 5 _____

3 _____ 6 _____

10b. What are your present gross revenues/year? $_____

12. Which of these did you sell before 1985?

_____ _____ _____ _____ _____

13. What are your main areas of research/development for the future?

1 _____ 3 _____

2 _____ 4 _____

a. What was the topic of your ERDA project? _____

_____

_____

b. What stage are you now at in your project? _____

_____

_____

_____

Project Impacts Had Your Project Funding Gone Ahead:

. ERDA contribution needed?

	85/86	86/87	87/88	88/89	89/90
$K	_____	_____	_____	_____	_____

22a. How would the project have created improvements to:

	Yes	No	Don't Know
ur firm's efficiency	_____	_____	_____
ur customer's efficiency	_____	_____	_____
e future growth of your industry	_____	_____	_____
e future growth of other industries	_____	_____	_____

yes for any, what improvements? _____

_____

_____

_____

_____

_____

_____

. Would the project have increased your firm's productivity

_____Yes _____No _____Don't Know

If yes, by how much _____% (of what _____)

and how? _____

_____

_____

. Would the project have increased the productivity of other industries? _____yes _____no _____don't know
If yes, by how much _____% (of what _____)
which industries and how? _____

_____

_____

27. In addition to ERDA contributions, how much private investment would your firm or other private sources have contributed to your project, in addition to your normal annual investment?

fore project	85/86	86/87	87/88	88/89	89/90	90/91	91/92
_____	_____	_____	_____	_____	_____	_____	_____

26a. For 1988/89 to 1991/92, what is the probability that the projected private investment would have been made _____%

26b. Has the program had any effect on the general investment climate in your industry?
What effect? _____positive _____neutral _____negative
Elaboration _____

_____

_____

General Effect of Sub-Agreement Technology Application Component

41. What are the main problems affecting your industry?
(access to capital, small market, specialized labour, management skills, marketing infrastructure, technology, profitability)

_____

_____

_____

_____

_____

_____

_____

_____

42a. How has your firm attempted to overcome these problems? _____

_____

_____

_____

b. Would the Technology Application Program/staff/funding assisted you in overcoming these problems? _____Yes _____No _____don't know
Elaborate _____

. Would the program have improved the technical or management skills of your firm? _____Yes _____No _____don't know
If yes, how? _____

If no, why not?

:. Would the program have improved your firm's ability to attract private investment? _____yes _____no _____don't know
If yes, how and from what sources? _____

If no, why not?_____

5. Has/will the program improve your industry's diversification?
_____Yes _____No _____don't know
If yes, how?_____

If no, why not?_____

_____

. Has the program funds been distributed proportionately among all types of eligible fields? _____yes _____no _____don't know

If no, why not? _____

_____

_____

a. Has funding been allocated proportionately among large and small firms?

_____yes _____no _____don't know

If no, why not?_____

_____

_____

_____

b. Has funding been allocated proportionately among all ethnic and social groups? _____ yes _____ no _____ don't know

If not, why not? _____

_____

_____

. How many weeks did it take between your first contact with program staff and your initial request for funding? _____weeks

. Between your initial request and your full proposal? _____weeks

0. Between your full proposal and the withdrawal/ rejection? _____weeks

a. Are you satisfied with the speed of this process?

_____ yes _____no _____don't know

If no, what part of the process was delayed and why?

_____48. _____

_____49. _____

_____50. _____

_____other _____

b. Were you satisfied with the way decisions were made, and staff assisted you? _____ yes _____ no _____ don't know

Elaborate _____

_____

_____

4. Is your industry aware of both the federal and provincial contributions to the Sub-Agreement?

_____yes _____no ____don't know

If no, why not? _____

_____

_____

_____

_____

_____

5. Is the public aware of both governments' contribution?

_____yes _____no _____don't know

If no, why not? _____

_____

_____

_____

6. The ERDA objectives are to complement Manitoba's economic development strategy, increase employment and income opportunities, maximixe social and economic benefits, foster cultural products, strengthen human, managerial, creative, financial, technological, and structural resources and stimulate private sector investment. Is the present program the most effective mechanism to achieve the expected objectives and impacts?

_____yes _____no _____don't know

If no, why not? (program funding appropriate?)_____

_____

_____

_____

If no, what should be changed and how? _____

_____

_____

_____

7. How could future programs be improved to better meet the needs of industry?

_____

_____

_____

_____

59. As your project funding is not available, what % of your project have you undertaken? _____% of original proposed

_____ no significant change - funds available from other source

_____ delayed project by _____ years

_____ other (explain) _____

_____

_____

_____

. If some of project was carried out, what source of funds?

_____ used other funds you had at the time

$K

_____ other federal government funds

_____ provincial government funds

_____ funds from private sources

_____ your own organizations funds

_____ other (specify) _____

_____ obtained additional funds from other sources

_____ other federal government funds

_____ provincial government funds

_____ funds from private sources

_____ your own organizations funds

_____ other (explain) _____

60. Are you aware of similar projects being carried out independently on the same topic? _____yes _____no _____don't know

If yes, was this parallel project being carried out in Canada?

_____yes _____no

61. Have/will the same project results have been/be generated (by your firm or another) if the program had not existed?

_____yes _____no _____don't know

If yes, would/will the results occur at the same time

_____yes _____no _____don't know

If no, the results would/will occur _____years later

7. Do you have any other comments or information on the economic impacts of the program or your project? _____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR HELP

Interview #_____

ERDA TECHNOLOGY APPLICATIONS COMPONENT

ECONOMIC IMPACT INTERVIEW GUIDE

(Industry Representatives)

Basic Data

Date: day _____ month _____

Name: _____ 3. Position: _____

4. Organization: _____

Address: _____

_____

Telephone: (___)_____

. What year did your association/group begin operations? in Manitoba?_____

What industry do you represent? _____

. What actvities does your group sponsor? _____

IMPACTS OF THE PROGRAM

). In general, what has/will be the effect of the program on your industry's level of output? _____

_____

_____

_____

3/4 productivity? _____

_____

_____

16/9 employment? _____

_____

_____

7 marketing activities? _____

_____

_____

J. export activities? _____

_____

_____

36. profitability? _____

_____

_____

. In your industry, what proportion of marketing and promotion expenditures are made in foreign markets?

_____% before program _____% during program _____% after program

. Before the program, what proportion of your products/service inputs were produced in Manitoba?

_____% materials and equipment

_____% labour inputs

_____% investment

. After the program, what proportion do you expect to be produced in Manitoba?

_____% materials and equipment

_____% labour inputs

_____% investment

. Has the program helped develop spin-off industries or joint ventures?

_____ yes _____ no _____ don't know

If yes, what spin-off or joint ventures? _____

_____

_____

_____

_____

5b. Has the program had any effect on the general investment climate of your industry?

____positive _____neutral _____negative

If yes, positive, what effect? _____

_____

_____

_____

If negative, what effect?_____

_____

_____

. What are the main problems affecting your industry?
(access to capital, small market, specialized labour, management skills, marketing infrastructure, technology, profitability)

_____

_____

_____

_____

_____

41. How has your organization attempted to overcome these problems? _____

42b. Has/will the Technology Application Program/staff/funding assisted you in overcoming these problems? _____Yes _____No _____don't know
Elaborate _____

43. Has/will the program improve the technical or management skills of your industry? _____Yes _____No _____don't know
If yes, how? _____

_____If no, why not?

.. Has/will the program improve your industry's ability to attract private investment? _____yes _____no _____don't know
If yes, how and from what sources? _____

If no, why not?_____

_____

_____

_____

5. Has/will the program improve your industry's diversification?

_____Yes _____No _____don't know

If yes, how?_____

_____

_____

_____

If no, why not?_____

_____

_____

_____

6. Has the program funds been distributed proportionately among all types of eligible fields? _____yes _____no _____don't know

If no, why not? _____

_____

7a. Has funding been allocated proportionately among large and small firms?

_____ yes _____no _____don't know

If no, why not?_____

_____

_____

_____

7b. Has funding been allocated proportionately among all ethnic and social groups? (women, Natives, francophones)

_____yes _____no _____don't know

If no, why not?_____

_____

_____

_____

8. Are you satisfied with the speed of the application and delivery of the program?

_____ yes _____no _____don't know

If no, what part of the process was delayed and why?

_____

_____

_____

. Is your industry aware of both the federal and provincial contributions to the Technology Application Component?

_____yes _____no ____don't know

If no, why not? _____

55. Is the public aware of both governments contribution?

_____yes _____no _____don't know

If no, why not? _____

. The ERDA objectives are to complement Manitoba's eocnomic development strategy, increase employment and increase opportunities, maximize social and economic benefits, foster cultural products, stengthen human, management, creative, financial, technological and structural resources, and stimulate private sector investment. Is the present program the most effective mechanism to achieve the expected objectives and impacts?

_____yes _____no _____don't know

if no, why not? (program funding appropriate?)_____

If no, what should be changed and how? _____

_____

_____

_____

. How could future programs be improved to better meet the needs of industry?

_____

_____

_____

_____

_____

. Do you have any other comments or information on the economic impact of the program or your project? _____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR HELP

APPENDIX C

ECONOMIC IMPACT METHODOLOGY

APPENDIX C
ECONOMIC IMPACT METHODOLOGY

C.1 Introduction and Overview

The purpose of this Appendix is to present the methodology used in calculating the quantitative economic impacts presented throughout the report. For this study, economic impacts were calculated for projects receiving or allocated contributions under Component 1 of the Agreement - Technology Applications Projects. The study assesses impacts occurring annually from 1984/85 to 1991/92.

Economic impacts measure the economic activity associated with cash expenditures by final consumers. An initial expenditure results in income and employment for direct industry recipients, i.e. the company owners and employees. Purchases of goods and services from suppliers and contractors, and their subsequent respending generate indirect impacts. Induced impacts result from the spending of wage income on consumer goods and services. The sum of direct, indirect and induced impacts represent the total economic impact.

Income refers to Gross Domestic Product (GDP) or value added. Value added is the sum of gross labour returns (wages and salaries) and gross capital returns (depreciation allowances plus interest payments plus pre tax profits).

The total magnitude of income and employment impacts depends both on the absolute level of expenditure as well as the multiplied effects on the rest of the region. The multiplied effects depend on the economic structure of the region, particularly the import content of goods and services purchased.

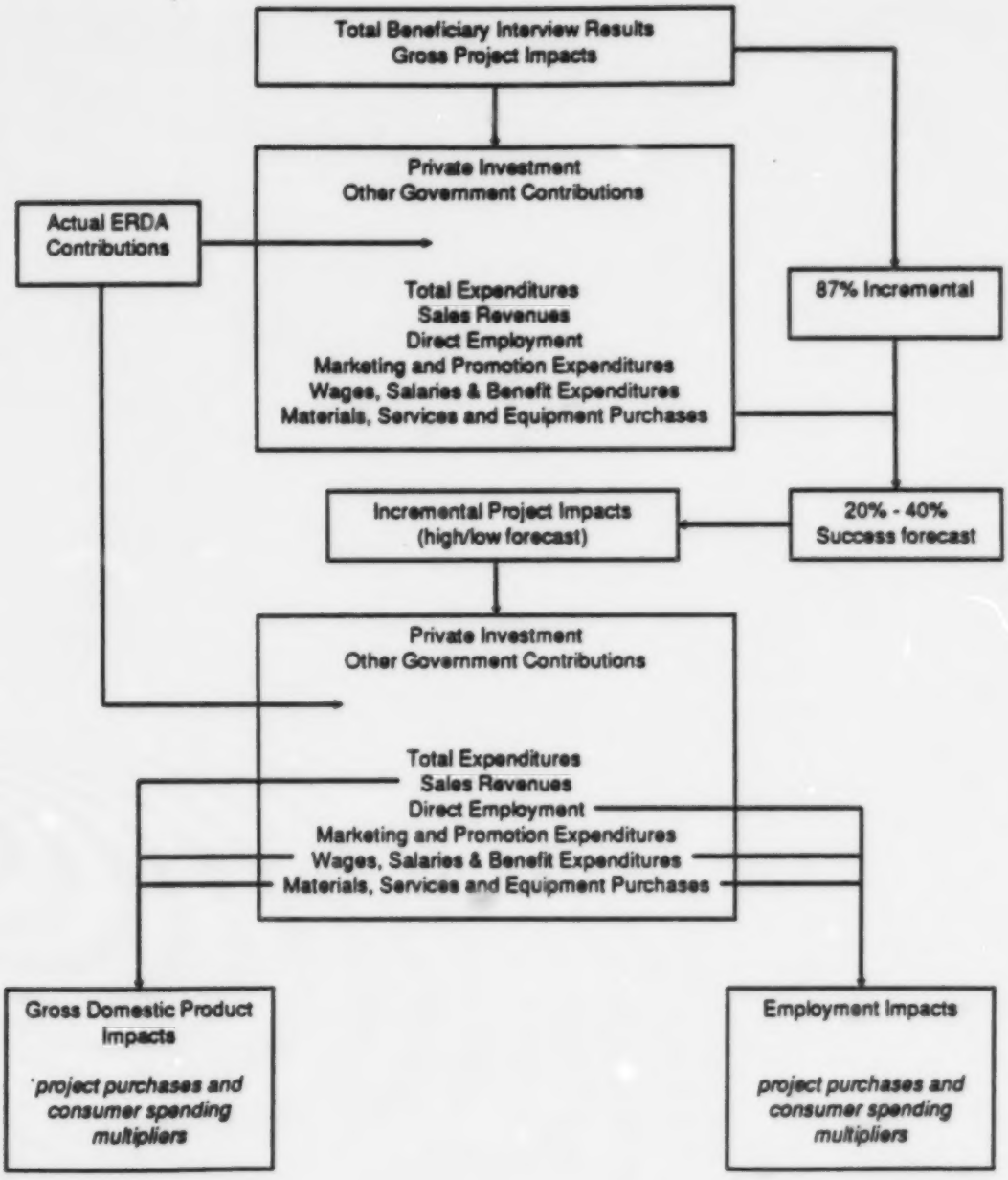
C.2 Analysis

Exhibit C.1 shows an overview of the calculation method used.

The activities considered in this impact include most projects funded under Component 1 of the Agreement but exclude administrative projects such as evaluating proposals or performing audits. In addition the management of the Agreement has not been included in calculating impacts.

Gross impacts were estimated by summing the impacts for all 18 beneficiaries interviewed - firms or groups receiving contributions under the Agreement - and inflating these to account for non-respondents (either the three beneficiaries not interviewed or interview respondents who were unable to supply estimates of employment, expenditure, sales, etc. for one or more years in the forecast period). This assumes

Exhibit C.1: Economic Impact Calculation Method



that those unable to supply forecasts and non-respondents will experience sales employment, etc. equal to the average of those able to forecast. See Section 3.2.1 for a discussion of possible low-response bias. Gross impacts are shown in Exhibit C.2.

Gross impacts were then reduced to incremental impacts: first by applying an assumed rate of 87% incrementality (as discussed in Section 3.2.2)'; and then by further reducing impacts occurring in the future to account for the likely rate of business success (as discussed in Section 3.2.1). Incremental impacts are shown in Exhibit C.3.

Gross Domestic Product and employment impacts were then derived from incremental impacts. One can calculate economic impacts using two alternate approaches - one by applying a normal (or absolute) multiplier to incremental expenditures and the other by applying a ratio multiplier to direct impacts. The normal multiplier approach is used in this study.

While direct GDP was calculated from sales revenue only (research during the project itself was assumed to generate value added only when sales of resulting goods and services occurred), direct employment was taken directly from survey results and includes both research project employment and direct employment generated by sales of goods and services.

For GDP calculations:

- first, the portion of incremental sales revenues which would flow to labour and capital were calculated as direct GDP (beneficiaries surveyed estimated that, on average, wages, salaries and benefits would be 37.3% and purchases of goods and services from others, 32.6% of sales revenue - the remaining 30.1% is assumed to be capital surplus);

- then, the GDP generated by project purchases (32.6% of sales revenue) was found by multiplying that portion of sales revenue by an average of four industries GDP multipliers - electronic products, communications, business services and travel, advertising and promotion. These industries are those which supply the bulk of goods and services purchased; and

- finally, the GDP generated by the consumer spending of direct employees is calculated by finding the labour income portion of sales revenue (37.3%) and assuming that, like the whole province, 70% of this labour income is respent. This repending is multiplied by an appropriate GDP multiplier for personal expenditures.

For employment calculations:

- first the incremental direct employment estimated by beneficiaries is taken from survey results;

- then the employment generated by project purchases of goods and services is found by multiplying 32.6% of sales revenue (average project purchases from the survey) by the average employment multiplier of the four industries supplying goods and services; and

- finally, the employment generated by consumer spending of direct employees was found by taking the 70% of labour income assumed to be respent (from GDP calculation) and multiplying an appropriate employment multiplier for personal expenditures.

EXHIBIT C.2: GROSS PROJECT IMPACTS[1]

	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92
Direct Employment (person years)								
Full Time	--	16.3	22.4	23.9	75.3	228.9	426.8	611.3
Part Time[2]	--	0.6	3.7	6.7	7.7	7.7	10.4	11.5
Total Person Years	--	16.9	26.1	30.6	83.0	236.6	437.2	622.8
Private Investment ($k)	88.2	130.2	350.7	1,064.7	3,945.9	5,936.7	7,658.7	7,883.4
Other Government contributions ($K)	35.1	87.6	131.9	191.1	2,507.0	2,592.2	6,251.1	7,049.1
ERDA Contributions ($K)	114.9[3]	379.8	846.5	707.3	3,402.9	514.8	--	--
Total Project Expenditures ($K)	145.8	396.8	954.3	1,912.1	9,413.1	14,299.2	36,385.3	57,835.9
Project Sales Revenues ($K)	--	43.3	24.0	218.8	2,311.4	11,123.8	35,850.6	69,473.7
Marketing and Promotion Expenditures ($K)	--	43.3	126.0	129.9	1,333.5	3,738.0	5,702.5	11,492.7

1 Interview results are inflated to represent all beneficiaries. Impacts therefore assume non-respondents have the same average characteristics as respondents. For a discussion of possible low response bias see Section 3.2.1.

2 Assumes 1 part time = 1/3 person year

3 Includes $84.7 and $30 in 1984/85 for feasibility studies funded from Departmental A-Base ,not ERDA.

EXHIBIT C.3: INCREMENTAL PROJECT IMPACTS[1]

	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92
Direct Employment (person years)								
low forecast	--	14.7	22.7	26.6	28.9	61.7	76.1	108.4
high forecast	--	14.7	22.7	26.6	43.3	102.9	152.2	216.7
Private Investment ($K)								
low forecast	76.7	111.3	305.1	926.3	1,373.2	1,549.5	1,332.6	1,371.7
high forecast	76.7	111.3	305.1	926.3	2,059.7	2,582.5	2,665.2	2,743.4
Other Government Contributions ($K)								
low forecast	30.5	76.2	114.8	166.3	872.4	676.6	1087.7	1,226.5
high forecast	30.5	76.2	114.8	166.3	1,308.7	1,127.6	2,175.4	2,453.1
ERDA Contributions[2] ($K)	114.9	379.8	846.5	707.3	3,402.9	514.8	--	--
Project Total Expenditures[3] ($K)								
low forecast	141.8	385.9	940.3	1,755.5	3,452.7	3,752.2	6,331.0	10,063.4
high forecast	141.8	385.9	940.3	1,755.5	5,179.1	6,253.6	12,662.1	20,126.9
Project Sales Revenues ($K)								
low forecast	--	20.4	20.9	190.4	804.4	2,903.3	6,238.0	12,088.4
high forecast	--	20.4	20.9	190.4	1,206.5	4,838.9	12,476.0	24,176.8
Marketing and Promotion Expenditures ($K)								
low forecast	--	37.7	109.6	113.0	464.1	975.6	992.2	1,999.7
high forecast	--	37.7	109.6	113.0	696.1	1,626.0	1,984.5	3,999.5

EXHIBIT C.3: INCREMENTAL PROJECT IMPACTS[1] (continued)

1 Gross impacts are reduced by 13%, to account for the effects which beneficiaries said would have occurred without the program. See Section 3.3.2. Also, gross impacts forecasts are reduced to 20% - 40% to account for future business success according to the following schedule:

	1985/85 to 1987/88	1988/89	1989/90	1990/91	1991/92
low forecast	100%	40%	30%	20%	20%
high forecast	100%	60%	50%	40%	40%

2 ERDA Contributions are assumed to be 100% incremental and have not been reduced to account for success in the future.

3 Only the non-ERDA Contribution expenditures have been reduced by 13% and reduced to 20% - 40%.

EXHIBIT C.4: INCREMENTAL GROSS DOMESTIC PRODUCT IMPACTS ($K)

	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92
Incremental Project Sales Revenues								
low forecast	--	20.4	20.9	190.4	804.4	2,903.3	6,238.0	12,088.4
high forecast	--	20.4	20.9	190.4	1,206.5	4,838.9	12,476.0	24,176.8
Gross Domestic Product								
Direct GDP[1]								
low forecast	--	13.8	14.1	128.3	542.2	1,956.8	4,204.4	8,147.6
high forecast	--	13.8	14.1	128.3	813.2	3,261.4	8,408.8	16,295.2
Project Purchases[2]								
low forecast	--	6.0	6.1	37.4	234.7	847.1	1,820.1	3,527.0
high forecast	--	6.0	6.1	37.4	352.0	1,411.9	3,640.1	7,054.1
Consumer Induced[3]								
low forecast	--	2.7	2.8	25.5	107.7	388.9	835.5	1,619.2
high forecast	--	2.7	2.8	25.5	161.6	648.1	1,671.1	3,238.4
Total GDP[4]								
low forecast	--	22.5	23.0	191.2	884.6	3,192.8	6,860.0	13,293.8
high forecast	--	22.5	23.0	191.2	1,326.8	5,321.4	13,720.0	26,587.7

EXHIBIT C.4: INCREMENTAL GROSS DOMESTIC PRODUCT IMPACTS ($K) (cont'd)

1 Only GDP from sales revenues is included. The research itself has not been considered to have GDP effects, until the subsequent sale of goods and services resulting from research. The direct GDP or value added calculated is 67.4% of incremental sales revenues. This is taken from survey data where, on average, beneficiaries expected 37.3% of sales revenue would be required for labour costs and 30.1% for capital surplus and is comparable to industry averages.

2 Value added in industries supplying goods and services purchased by projects. Beneficiaries reported that about 32.6% of sales revenue would be spent on purchases. This portion of sales was multiplied by a GDP normal multiplier of 0.895 to find the value added created (the average GDP multiplier for 4 industries - electronic products, communications industries, business services and travel, advertising and promotion from Manitoba Bureau of Statistics' Manitoba Economic Multipliers, January 1985).

3 Value added in industries supplying consumer goods and services to direct employees. As in note 1, the 37.3% of sales required for wages, salaries and benefits was found, of which 70% is assumed to be available for personal expenditures (Manitoba Bureau of Statistics, Manitoba Provincial Economic Accounts, 1961 to 1986, January 1988.) To this 70%, a GDP normal multiplier of 0.513 is applied to estimate the value added created in those industries supplying consumer services (Statistics Canada, Input Output Tables, Structural Analysis Division, 1985).

4 The portion of total GDP which is generated in Manitoba can be estimated by applying survey results from two questions to the three types of GDP: beneficiaries estimate that 91.5% of direct employment created will be in Manitoba on average and this percentage of direct and consumer induced GDP has therefore been assumed to occur in Manitoba; beneficiaries also estimate that 22% of their material and equipment purchases will be produced in Manitoba on average and this percentage of project purchase GDP will therefore occur in the province.

EXHIBIT C.5: INCREMENTAL EMPLOYMENT IMPACTS (person years)

	1984/85	1985/86	1986/87	1987/88	1988/89	1989/09	1990/91	1991/92
Direct Employment[1]								
low forecast	--	14.7	22.7	26.6	28.9	61.7	76.1	108.4
high forecast	--	14.7	22.7	26.6	43.3	102.9	152.2	216.7
Project Purchases[2]								
low forecast	--	0.2	0.2	1.6	6.8	24.4	52.5	101.7
high forecast	--	0.2	0.2	1.6	10.2	40.7	104.9	203.3
Consumer Induced[3]								
low forecast	--	0.1	0.1	0.6	2.4	8.6	18.4	35.7
high forecast	--	0.1	0.1	0.6	3.6	14.3	36.8	71.3
Total Employment[4]								
low forecast	--	15.0	23.0	28.8	38.1	94.7	147.0	245.8
high forecast	--	15.0	23.0	28.8	57.1	157.9	293.9	491.3

1 This includes both research staff and jobs generated by sales revenue as estimated by beneficiaries and is taken from Exhibit C.3.

2 Beneficiaries reported on average that 32.6% of incremental sales revenue would be spent on purchases of goods and services. This portion of sales was then assumed to created 0.0258 person year years employment per $thousand purchases. This employment multiplier was found by updating Manitoba Bureau of Statistic's employment multipliers from 1984 to 1988 dollars for 4 industries - electronic products, communications, business services and travel, advertising and promotion - and calculating their average.

3 Beneficiaries reported that, on average, 37.3% of incremental sales revenue would be required for wages. salaries and benefits, of which 70% is assumed available for personal expenditures (Manitoba Bureau of Statistics, Manitoba Provincial Economic Accounts, 1961 to 1986, January 1988). To this 70% respent by direct employees, an employment multiplier of 0.0113 person years per $ thousand of spending was applied (Statistics Canada Input Output Tables, Structural Analysis Division, 1985).

APPENDIX D

BREAK EVEN BENEFIT/COST METHODOLOGY

APPENDIX D
BREAK EVEN BENEFIT/COST METHODOLOGY

This form of benefit-cost analysis essentially asks the question: is it likely that the future stream of economic benefits to be generated by funded projects and others will exceed in present value the costs to society of the program? This form of analysis is needed because while project costs are easily identified and estimated, the economic benefits from most funded projects are problematic and will take place in the future.

In summary, the analysis involved the following steps:

1. Total project costs - including Agreement contributions and financing from other sources - was adjusted to account for past inflation and the social opportunity cost of labour. Total Incremental Investment as shown in Exhibit D.1 was converted to 1988 dollars and its social cost was estimated to be 96.3% of total investment (this assumes labour costs have an opportunity cost of 90% and represent 37.3% of investment).

EXHIBIT D.1: SOCIAL COST OF PROGRAM

	Incremental Investment ($K current)	($K 1988)	Social Cost ($K 1988)
1984/85	222.1	251.2	241.8
1985/86	567.3	616.6	593.6
1986/87	1,266.4	1,316.4	1,267.3
1987/88	1,799.9	1,799.9	1,732.8
1988/89	5,648.5-6,771.3	5,648.5-6,771.3	5,437.8-6,518.7
1989/90	2,740.9-4,224.9	2,740.9-4,224.9	2,638.7-4,067.3
199091	2,420.3-4,840.6	2,420.3-4,840.6	2,330.0-4,660.1
1991/92	2,598.2-5,196.5	2,598.2-5,196.5	2,501.3-5,002.7
Total	$17,263.6-24,889.0	17,392.1-25,017.5	16,743.4-24,084.3

Net Present Value to 2007/2008		
	8%	$11,974.1-$16,668.8
	10%	$11,082.0-$15,306.2
	12%	$10,280.5-$14,090.1

2. Three types of benefits were explored - increased operating profits and labour income for beneficiaries, increased productivity for customers who purchase goods

and services from beneficiaries and indirect technological developments or spinoffs - but only the first could be estimated. Direct benefits to beneficiaries from operating profit and labour income growth was estimated at 14% of sales revenue. This represents about 10% operating profit growth and 4% labour income and excludes depreciation, interest charges (transfers not benefits) and the labour income of workers who would otherwise be employed. This is a conservative estimate of benefits as most beneficiaries expect much higher profits. Exhibit D.2 shows this calculation. Other types of benefits are still likely but it was not possible to estimate them.

3. For both costs and benefits the streams were discounted at 8%, 10%, and 12% discount rates as shown in Exhibits D.1 and D.2. At 10% costs roughly equal benefits.

This breakeven analysis cannot be treated as a full benefit-cost analysis however, it does illustrate that using conservative assumptions, one of three potential benefit streams is roughly equal to the social cost of the program in present value terms. Therefore, it is likely that benefits will exceed costs if all benefits could be quantified.

EXHIBIT D.2 SOCIAL BENEFIT OF PROGRAM

	Incremental Sales Revenue ($K current)	($K 1988)	Social Benefits ($K 1988)
1984/85	--	--	--
1985/86	20.4	22.2	3.1
1096/97	20.9	21.7	3.0
1098/99	190.4	190.4	26.7
1988/89	804.4-1,206.5	804.4-1,206.5	112.6-168.9
1989/90	2,903.3-4,838.9	2,904.4-4,838.9	406.5-677.5
1990/91	6,238.-12,476.0	6,238.4-12,476.8	873.3-1,746.6
1991/92	12,088.4-24,176.8	12,088.4-24,176.8	1,692.5-3,384.8
1992/2008	12,088.4-24,176.8	12,088.4-24,176.8	1,692.4-3,384.8
Net Present Value to 2007/2008	**8%**		**$10,664.6-$21,169.0**
	10%		**$8,510.7-$16,873.5**
	12%		**$6,873.4-$13,610.0**

APPENDIX E
SUMMARY OF PROJECTS

APPENDIX E
SUMMARY OF PROJECT OBJECTIVES[1]

Date Approved	Project Beneficiary	
June 1985	Electronic Publishing	
	- Grassroots	- To provide farm marketing and interactive calculation programs on Grassroots Canada and Grassroots America. Twenty three new content packages were planned Cancelled.
	-Cybershare	- Info-Claim, an on-line database containing information on mineral exploration within the province of Manitoba. The data base was planned to contain all current public information on mineral claims. Cancelled.
	- Infotech.	- Implement an electronic information reference system as a stand alone microcomputer system, to permit electronic publishing products for the home to be distributed more broadly than videotex systems. Cancelled.
	- Homestead	- To develop a computer-based training program to aid in the teaching of farm financial management principles and agricultural credit analysis. Completed.
	- MTS	- To produce a turn-key messaging system which integrates electronic mail and bulletin board, computer conferencing and audio output response. Completed.

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1 objectives from Project Authorizations; status as of Mar. 31, 1988

	- MTS/Rescom	- To produce a system that gives stock quotations in computer generated voice format via a touch-tone telephone. Completed.
July 1985	MCALC	- A market study to confirm and identify a Canadian market for lessonware/courseware and a business strategy and funding to launch MCALC into a profitable and self-sustaining supplier of products for promotion of Canadian content, instruction in a second language, accommodating special needs and serving the physically disabled and others who may be culturally or environmentally disadvantaged. In progress.
Jan. 1986	--	- To conduct an Animation Centre Feasibility Study with a view to the establishment of an Animation Centre in Manitoba. Completed.
July 1986	NATCO	- To establish the head office of NATCO in Winnipeg to manufacture assemble and market products which form the basis of a systems approach to automatic meter reading for utilities. Cancelled.
July 1986	NORLUS	- To develop, manufacture and market natural language machine translation systems. In progress.
Dec. 1986	The DPA Group	- To produce a feasibility study to determine the viability of a business opportunity database concept as a business, including estimation of long term demand and competitive forces. Completed.

Dec. 1986	Tarry & Associates/ Clinicom	- To provide direction for strategic technology development, a study was commissioned to identify and analyze the strengths and weaknesses of the communications/informatics sector and a structured workshop held to produce recommendations for the consideration of the Steering committee. Completed.
Jan. 1987	Sub Rosa	- To develop a simple to use, task oriented program generator for d-Base III and VP-Info packaged software programs for IBM, MacIntosh and Atari brand groups. In progress.
Mar. 1987	--	Audits to ensure proper and accurate accounts and records are kept and maintained for each project. In progress.
May 1987	Ubitrex	- To conduct an evaluation of the market aspects of the Nursing Unit Reporting System (NURS) project, examining manufacturers likely to compete with NURS including their pricing strategy, market penetration and characteristics of the products. Completed.
June 1987	Tarry & Associates	- To stimulate the submission of new project proposals by following up on a mailing of <u>The Guide for the Submission of Proposals</u>, assisting prospective applicants, checking that their projects fit ERDA objectives, and publicity through speeches, holding workshops/meetings and publishing articles. Completed.

July 1987	IRIS	- To identify opportunities for partnering arrangements between MTS and other Manitoba companies, to recommend prospective proposals and to initiate and facilitate negotiations between MTS and prospective partners. Completed.
Sept. 19897	GEC Canada	- To research and develop a system to be used for Multichannel Microwave Distribution Service, requiring a broad band distribution system that can transmit cable television to households without the need for physical cable. In progress.
Oct. 1987	CAD Systems	- To complete the development of a user-friendly interactive graphics software package and market it across Canada and the U.S. In progress.
Oct 1987	Uibtrex	- To design, develop, test, manufacture and market a hospital bedside data collection and information process system. In the longer term the objective is to incorporate additional bedside functions into this system and to produce other systems to increase health care efficiency. On hold.
Nov. 1987	--	- To assist in the analysis of highly specialized projects submitted to the Steering Committee for ERDA funding when expertise is not available from government sources. Not used.

Nov. 1987	--	- To create a private sector research centre - Canadian Telematics and Health Care Centre - to assist in setting up the organization and determine its business and science plans. In progress.
Dec. 1987	IRIS	- To complete the development of an automatic meter reading prototype system, to install and begin marketing the system by demonstrating it to utilities. In progress.
Jan. 1988	Homestead	- Original focus on enhancing prototype expert system crop planner products later changed to an expert system based credit analysis program. On hold.
Jan. 1988	Rescom	- To develop a software product to monitor, prescreen and correlate all of the information available to an Account Executive or Portfolio Manager of a brokerage company, using knowledge-based expert systems techniques. In progress.
Mar. 1988	IAI	- To develop a product (a knowledge-based software package expert system) to permit patients with cancer to receive improved treatment by making consultant medical expertise available in remote areas with the help of telematics. In progress.
Mar. 1988	Voisys	- To develop a PC-based, user-friendly voice response system which allows a telephone to interface with a computer. In progress.